From Knowledge to Wisdom

ISSN 1537-1506 CBSN 270B0069

Chinese Business Review

Volume 12, Number 12, December 2013

David Publishing Company
www.davidpublishing.com

Chinese Business Review

Volume 12, Number 12, December 2013 (Serial Number 126)

David Publishing Company
www.davidpublishing.com

Publication Information:
Chinese Business Review is published monthly in hard copy (ISSN 1537-1506) and online by David Publishing Company located at 240 Nagle Avenue #15C, New York, NY 10034, USA.

Aims and Scope:
Chinese Business Review, a monthly professional academic journal, covers all sorts of researches on Economic Research, Management Theory and Practice, Experts Forum, Macro or Micro Analysis, Economical Studies of Theory and Practice, Finance and Finance Management, Strategic Management, and Human Resource Management, and other latest findings and achievements from experts and scholars all over the world.

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Editorial Office:
240 Nagle Avenue #15C, New York, NY 10034, USA E-mail: economists@davidpublishing.com

Abstracted / Indexed in:
Database of EBSCO, Massachusetts, USA
Ulrich's Periodicals Directory, USA
ProQuest/CSA Social Science Collection, Public Affairs Information Service (PAIS), USA
Cabell's Directories, USA
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Subscription Information:
Print $520 Online $360 Print and Online $680
David Publishing Company, 240 Nagle Avenue #15C, New York, NY 10034, USA
Tel: +1-323-984-7526, 323-410-1082 Fax: +1-323-984-7374, 323-908-0457
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Chinese
Business Review

Volume 12, Number 12, December 2013 (Serial Number 126)

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Chinese Business Review, ISSN 1537-1506
December 2013, Vol. 12, No. 12, 789-806

Community Based Natural Resource Management, Tourism and Poverty Alleviation in Southern Africa: What Works and What Doesn't Work

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Community based natural resource management (CBNRM) is perhaps the most important tool for driving community and rural development in southern Africa. The paper therefore analyses the CBNRM framework as a strategy for implementing sustainable tourism and poverty alleviation initiatives in Botswana, Namibia, and Zambia. The article specifically underscores the importance of local-level participatory management and utilisation of natural resources in the region. Paying special attention to the previous researches that have been conducted in Botswana, Namibia, and Zambia, the methodological approach employed in the paper centres on critical discourse analysis and review of literatures to highlight the interface existing between CBNRM and rural (tourism) development. The analytical framework of the paper is thus rooted in the Common Property Resource (CPR) theory. Overall, the authors argue that tourism, poverty alleviation, rural development, and sustainable natural resource use are linked and interrelated in the process of enhancing community well-being. Findings indicate that CBNRM initiatives have had a significant and positive impact in achieving sustainable tourism, rural development, poverty alleviation, and natural resource management. Specifically, findings show that the CBNRM has contributed to the reduction in wildlife poaching. While other pertinent issues remain, national governments in the three southern African economies need to fully appropriate the benefits that CBNRM offers and improve on them for better implementation of developmental programs.

Keywords: community, institutions, common property, local knowledge, rural development, southern Africa

Introduction

Natural resources are the most significant drivers of rural livelihoods. However, the relationship between humans and natural resources is generally impactful and dependency-oriented. While on the one hand, humans are generally highly dependent on the quality and availability of natural resources, they, on the other hand,

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significantly impact on these resources in a manner that threatens their sustainability. One of the most significant developments in natural resource governance in southern Africa has been the integration of communities into their (natural resources) management (Jones, 2002; Mbaiwa, 2011). Jones (1999) stated that the last decade or more has witnessed a growing focus on social, economic, and environmental research in natural resources management (NRM) leading to the emergence of community based natural resource management (CBNRM). More recently, tourism development and increasing efforts at achieving rural economic integration have influenced growing enthusiasm in CBNRM by many governments, Non-Governmental Organization (NGOs), donors, and the private sector in their bid to achieve sustainable utilisation of natural resources.

However, effective management of natural resources has not always been easy to achieve. Mbaiwa (2011) argued that the CBNRM approach is built upon common property theory. Common property theory is rooted in the notion that common pool resources can be utilised sustainably, provided that certain principles are applied. Mbaiwa (2011) and Bromley (1992) stated that these principles include the autonomy and the recognition of the community as an institution, proprietorship and usufruct, rights to make the rules and viable mechanisms to enforce them as well as on-going incentives in the form of benefits that exceed costs. In other words, CBNRM programs in southern Africa are based on the understanding of these principles. Central to the CBNRM programs are the theory and assumptions underlying the political decentralisation of natural resources (Mbaiwa, 2011). Proponents of CBNRM argue that the management of resources by the central government has led to their frequent and chronic declines in the past several decades (for example, Boggs, 2000). As a result, the decentralisation of resources to local communities has the potential to promote conservation and rural development. Conservationists and scholars perceive the decentralisation of natural resources as a remedy to the chronic natural resources decline resulting from the central government's failure in ensuring effective resource management (Mbaiwa, 2011). The questions of what resources constitute the components of CBNRM programs and why they are; how appropriate and sustainable is the reliance on tourism industry for communities implementing CBNRM programs; what the effects of CBNRM on rural development and poverty alleviation are; and what study gaps still exist in CBNRM studies are answered in the paper.

Overall, the paper analyses the CBNRM framework as a strategy for driving sustainable tourism and poverty alleviation initiatives in southern African countries. The paper critically reviews past CBNRM-related studies in Botswana, Namibia, and Zambia (see Figure 1).

The Study Focus

Special attentions are paid on Botswana, Namibia, and Zambia in southern African region. Botswana is selected because of its continuous programs in CBNRM and its richness in wildlife, which is the main catalyst of CBNRM in the country. Some scholars argue that the numbers of wildlife species in Botswana have declined significantly in recent decades (Barnes, 1998; Moganane & Walker, 1995; Mordi, 1991; Perkins, 1996; Perkins & Ringrose, 1996). However, Mbaiwa (2011) opined that Botswana is one of the few countries in southern Africa that is still endowed with a variety of wildlife resources. As such, CBNRM in Botswana largely involves wildlife-based tourism activities such as photography and safari hunting (Mbaiwa, 2011). Namibia is also chosen as a component of the analysis in the paper because its CBNRM programs have been well researched and documented. Indeed, it is the only country that has embraced CBNRM in all its national development plans (Boudreaux & Nelson, 2011). In spite of its slow evolution, Zambia's CBNRM is also analysed because of its

uniqueness; Zambia's CBNRM has been integrative in nature, transiting from the wildlife sector to focusing on other natural resources like forestry and fisheries (USAID, 2011).

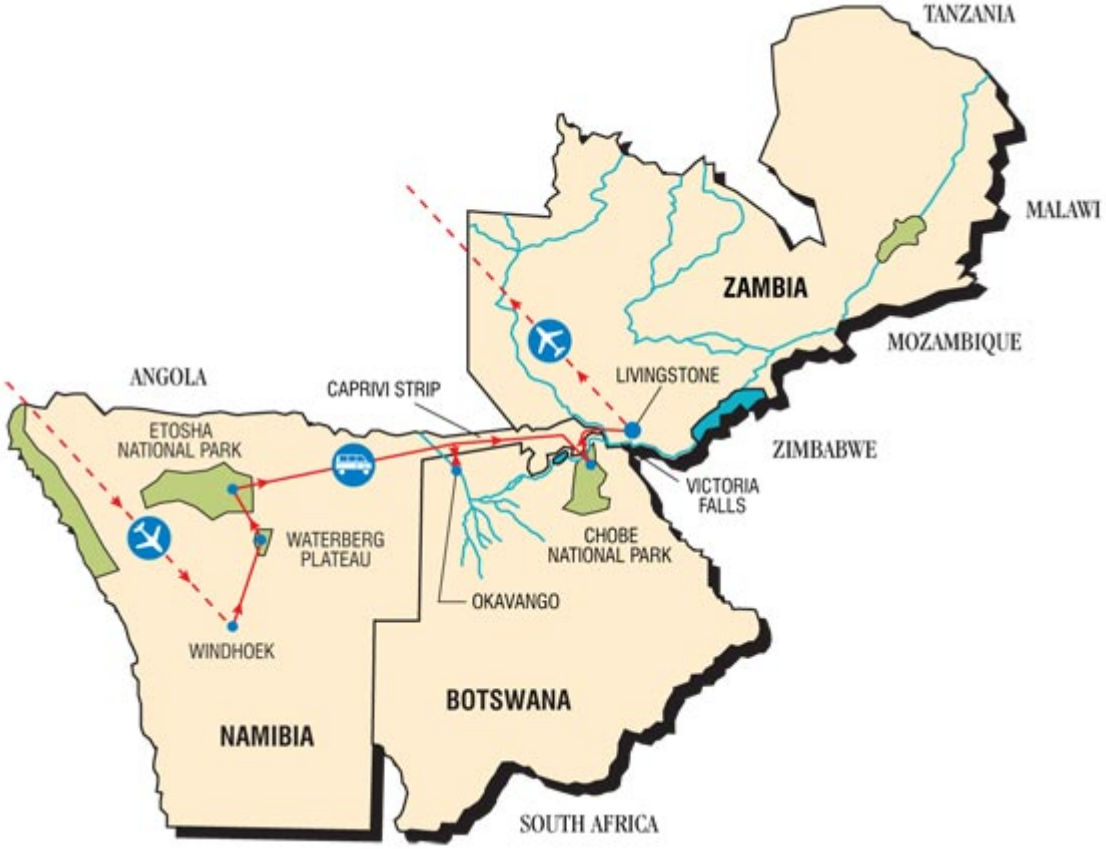

Figure 1. A map of Botswana, Namibia, and Zambia. Source: Naturetrek (2012).

Analytical Framework

The paper employs a critical discourse analysis in combination with qualitative case study approach (Veal, 1997; J. Hussey & R. Hussey, 1997; Jennings, 2001) to analyse available data. Critical review of current and relevant literature on the subject matter was carried out. Specifically current existing data from the literatures on CBNRM in three focal southern African countries of Botswana, Namibia, and Zambia were critically analysed with a view to assessing the successes and failures of CBNRM programme implementations in southern Africa. It also determines the nature of the interface among CBNRM, tourism, rural development, and poverty alleviation initiatives. Consequently data analyses were based on case study design (Yin, 2003, p. 111). Common Property Resource (CPR) theory served as the basis for developing a conceptual framework in the context of the paper. The theory places emphasis on how natural resources especially those shared by local communities can be sustainably used.

CBNRM

Africa is arguably said to be oldest continent; having remained in place since the breakup of panacea 200 million years ago (Bukenya, 2009). Africa has remained as the only landmass with an array of natural resources

unsurpassed in the world. It has been documented that "much of the world's biodiversity is located in Africa south of the Sahara. In some locations diversity is eight times the world average, four times that of the United States, and twice that of Brazil" (USAID, 2009). It is upon this rich biodiversity that tourism and rural livelihoods of local people are anchored in southern Africa. Perhaps as a result of improper implementation of CBNRM initiatives, these unique natural resources are now under siege; human impacts on biodiversity are increasingly severe. Forest, savannah, and tropical ecosystems are being rapidly degraded, along with national parks, game reserves, and fish. In their quest to gain social, cultural, and economic development, many African countries especially those in southern Africa now grapple with the decline in natural resources and high poverty rates (Mbaiwa, 2011). Yet the CBNRM program is one of the strategies adopted by a number of southern Africa countries to circumvent the threat against biodiversity and enhance poverty alleviation. USAID (2009) documented that CBNRM grew out of the recognition that unsustainable local practices were driving resource degradation in this part of Africa which is also very poor amidst plenty—that existing legal, social, and economic policies in particular, the absence of nationally recognized individual or communal resource tenure rights inhibit sustainable resource use; and governments in developing countries often lack of the financial or institutional resources to adequately manage or regulate natural resource use. The framework thus has three main goals of improving the livelihoods and quality of life of local people and helping to reduce rural poverty; enabling the wise use and conservation of natural resources and ecosystems; and empowering rural communities to make decisions on how to wisely use natural resources (USAID, 2009). In principle, CBNRM is premised on the idea that communities will sustainably manage local resources if they are assured of the ownership of those resources; allowed to use the resources themselves and/or benefit directly from others who use them and are given a reasonable amount of control over management of the resource (Mbaiwa, 2011; Twyman, 2000).

There is however a controversy among scholars as to whether CBNRM is a paradigm shift or a programme (Mbaiwa, 2011). In the context of this paper, CBNRM is discussed as a programme because it is a framework depicting an on-going development concern with a very long life-span. Weaver (2010) stated that a program is different from a project in that a program is a portfolio comprising multiple projects that are managed and coordinated as one unit with the objective of achieving (often intangible) outcomes and benefits for the organization. A project is a temporary entity established to deliver specific (often tangible) outputs in line with predefined time, cost, and quality constraints. That said, each southern African country has a unique name for CBNRM. Examples are the Communal Area Management Programme for Indigenous Resources (CAMPFIRE—Zimbabwe), NRM Project (NRMP/CBNRM—Botswana), Living in a Finite Environment (LIFE—Namibia), and the Administrative Management Design (ADMADE—Zambia). Reasoning from a project point of view, Mbaiwa (2011) affirmed that CBNRM success rate also differs from country to country and from project to project. Widely claimed and arguably so, the CAMPFIRE program has been documented and claimed to have been successful in achieving better conservation and livelihoods during its time (Child, Jones, Mazambani, Mlalazi, & Moinuddin, 2003; Mbaiwa, 2011). In terms of conservation, Child et al. (2003) rationalize their assertions on the ground that CAMPFIRE triumphed in the protection of an area of wild land roughly equivalent in size to the parks and wildlife estates of Zimbabwe which occupies an area of some 50,000 km^2. They further justify their claim in that there was also an increase in the wildlife population in areas reserved for safari hunting. Based on their findings, Child and his colleagues report that wildlife populations increased by about 50%, with elephants doubling from 4,000 to 8,000 in the CAMPFIRE areas in the first 10

years from its inception. From the perspective of better livelihoods, CAMPFIRE program's success in this area is justified by its acceptance countrywide where a total of 23 districts established CAMPFIRE projects; CAMPFIRE Association tremendously increased in membership within 10 years in Zimbabwe's 57 Rural District Councils. Also, CAMPFIRE is said to have increased the revenues from safari hunting to US$2 million annually; and "between 1989 and 2001, CAMPFIRE generated direct income of over US$20 million, with an economic impact of US$100 million" (Mbaiwa, 2011). The revenue generated from CAMPFIRE was re-invested in community projects such as building schools in rural areas and buying boreholes to provide water to both human beings and livestock. In addition, revenue has been devolved to participating communities at household levels (Child et al., 2003). Other scholars (Muir-Leresche, Chambati, & Khumalo, 2003) indicated that by the late 1990s, an estimated 90,000 households (630,000 people) were benefiting from CAMPFIRE revenue. Revenue obtained through CAMPFIRE has further been re-capitalised in the construction of lodges. Child and his team also report that at least 12 high-end tourism lodges have been developed in communal areas with funds generated through safari hunting. These lodges provide employment to rural people of Zimbabwe. Clearly, this shows the extent to which CAMPFIRE has positively impacted on sustainable utilisation of natural resources, rural development, and poverty alleviation in rural Zimbabwe.

From another vantage point, Jones (2004) argued that CBNRM programs attempt to simultaneously address two main issues of natural resources degradation and poverty alleviation. However, their solutions are often seen as being in direct conflict. CBNRM is governed by the philosophy of local-level control of common goods whereby communities play a crucial role in decision-making processes bordering on the sustainable utilisation and management of natural resources (Twyman, 2000). Thus it is safe to affirm that CBNRM is a conservation and rural development strategy, involving community mobilisation and organisation, institutional development, comprehensive training, enterprise development, and monitoring of the natural resource base (Mbaiwa, 2010; Blackie, 2006; Thakadu, 2005; Twyman, 2000). Elsewhere, Rotha et al. (2005) argued that CBNRM is a concept related to a variety of terms, including participatory, community, community-based, collaborative, joint, and popular natural resource management. These concepts are often used interchangeably but may also be used with the intention to emphasise specific characteristics of related approaches. Somehow, the concept of CBNRM tends to be associated with approaches dealing with joint natural resource management, where the local community is the focal point. Sometimes, it has also been applied to designated approaches where local communities play a central but not exclusive role in natural resource management.

Arguing from an adaptive co-management perspective, Borrini-Feyerabend, Pimbert, Farvar, Kothari, and Renard (2004) wrote that:

> Co-management (CM) of natural resources is used to describe a partnership by which two or more relevant social actors collectively negotiate, agree upon, guarantee and implement a fair share of management functions, benefits and responsibilities for a particular territory, area or set of natural resources. (p. 69)

DANIDA (2007) supports Borrini-Feyerabend et al. (2004) by reporting that the advantage of the delineation is that it concerned with different ways in which the planning and implementing authority overseeing natural resources can be shared among various social actors, thus refraining from pre-empting any a priori model of resource management.

Indeed, the CBNRM framework is perhaps the major tool for driving community and rural development in southern Africa (Madzwamuse, 2007). Thus, CBNRM is designed and put in place to enable local people

regulate the use of natural resources available within their environment and appropriate the same for the betterment of community socio-economic and ecological well-being (Mbaiwa, 2010). Tourism business has become one of the major earners of national income for a number of countries in southern Africa. The CBNRM, therefore, serves as an interface between tourism activities and the governments of southern African countries (Mbaiwa & Stronza, 2010).

The CPR

The world is presently faced with a myriad of natural resources and environmental management challenges. At the moment, frequent incidents of natural and made disasters such as floods, droughts, degeneration of biodiversity, pollution, loss of agricultural land, loss of wildlife, and overgrazing are now witnessed across the entire globe. One of the popular but controversial thesis explaining these problems is the theory of "CPR", which has become one of the most important bodies of theory steering the management of resources. Ostrom (1990) stated that natural and environmental resources typically present common pool resources characteristics such as that the exploitation by one user reduces resource availability for others (subtractability) and exclusion of additional users is especially difficult and costly (difficulty of exclusion). Fundamentally, the CPR theory is concerned with the way in which resources especially those shared by communities can be sustainably used. Proponents of this theory argue that all resources (such as wild animals, minerals, fish in rivers lakes and oceans, air, water, and forests) held in common will inevitably be overexploited (Ostrom, 1990; Ostrom & Field, 1999; Bromley, 1992; Gordon, 1954). Given that such resources have no private owner, it is in no one's interest to protect them or use them sustainably. The theory further argues that privately owned property, in contrast to the publicly owned ones, will be conserved. Many renowned economic scholars who have devoted themselves to studying the effects of ownership rights on exploitation rates have concluded that private ownership of natural resources has a number of benefits. In addition to conserving the resources, it ensures their efficient use and reduces transaction costs and overcapitalization (Cheung, 1970; Johnson, 1972; Scott, 1955; Ostrom, 2007). The CPR theory, therefore, perceives the benefit of private property to stem from the fact that secure property rights will wade off externalities. But then, it is more intriguing in some contexts to note that certain community people feel it is "rational" for users to overexploit natural resources than to conserve them (Scott, 1993). Underpinning the "tragedy of the commons", Hardin (1968) is of the opinion that the users of natural resources are caught up in a process that leads to the destruction of the natural assets upon which they (the common people) depend. Given that such resources are not individually managed or controlled, the ability to manage them therefore becomes challenging. Hardin's (1968) model of the tragedy of the common instigates that overexploitation of natural resources by community people will eventually lead to their degradation. Nonetheless, this thinking has been dispelled by scholars who see community people as agents of conservation. They argue that there exist "common-property resource management" strategies through which local people restrict access to the use of natural resources by invoking certain sanctions and procedural rules for their sustainable use (Feeny, Berkes, McCay, & Acheson, 1990; Berkes, 1989; Pinkerton, 1989, etc.). Consequently, the CBNRM framework is one of the co-adaptive management strategies, which has been employed by community people and other stakeholders in the conservation of natural resources available around local communities. The notion that people would judiciously use what belongs to them informs the school of thought on CBNRM advocacy.

Thus, the CBNRM approach is rooted on the foundation of the common property theory. CBNRM program in southern Africa is somewhat based on the understanding of the principles guiding the sustainable use of

common resources. Central to the CBNRM hypothesis are the theory and assumptions underlying the political decentralisation of natural resources and poverty alleviation. Boggs (2000) argued that the management of resources by the central government has been ineffective in the past and that the solution to the problems is the CBNRM approach. Decentralisation of resources to local communities has prospect in promoting sustainable resource utilisation and rural development. CBNRM promoters perceive the decentralisation of natural resources as a remedy to the chronic wildlife and other natural resources decline resulting from the central government failings in resource management (Mbaiwa, 2011). The decentralisation of natural resource management implies a process of redistribution of power and the transfer of responsibilities from the central government to rural communities in resource management (Boggs, 2000). This is a shift from the so-called top-down approach to a bottom-up approach in natural resource management. The assumption is that the decentralisation of natural resources to local communities will not only increase local power and control over resources, but it will also improve residents' attitudes towards sustainable use of natural resource and more importantly will also contribute to poverty alleviation (Scott, 1993).

CBNRM Framework in Southern Africa

By 1980 most countries in southern Africa had become independent and came to the realisation that their natural resources especially wildlife were under the threat of either depletion or extinction. They, therefore, embarked on the search for appropriate programmes that could enhance the protection of the natural resources and benefit accruing to the people therefrom. As such, informal CBNRM initiatives began in Zimbabwe and Namibia in the early 1980s (USAID, 2007b). CBNRM quickly and formally became famous through the CAMPFIRE projects in Zimbabwe. Although Zambia's ADMADE was launched before CAMPFIRE, it remained smaller and less well-known. Indeed, Zimbabwe, Botswana, and Namibia have the largest CBNRM programs, which were formally established through appropriate legislative change or specific programs in 1989, 1992, and 1996, respectively (USAID, 2007b). Countries such as Malawi (1994), Mozambique, and South Africa followed in quick succession, but the programs are smaller and more projects oriented.

As earlier observed, the objective of CBNRM in southern Africa has been the decentralisation of authority over natural resources from the state to communities who live within and around these resources (Jones, 2007). Although the resource scope is now broadening to include other natural resources, CBNRM in this region has focused mainly on wildlife resources and tourism. Whereas the programs in Botswana and Namibia have strongly depended on wildlife and tourism, Zambia projects do include forestry and fisheries (USAID, 2011). Also, USAID (2007a) reported that the emphasis on wildlife and tourism is as a result of communities being severely alienated historically from wildlife resources and which now stand to gain significantly in new income, if given the access. Attention is focussed on the CBNRM activities in Botswana, Namibia, and Zambia in the following sub-sections.

Botswana

CBNRM was first introduced in Botswana in 1990 through the United States Agency for International Development (USAID), which funded the Natural Resource Management Project (NRMP) together with the Botswana Government. Most CBNRM projects were and still are based on wildlife resources, but a few projects deal with veld products (Mbaiwa, 2011). The first CBNRM project was the Chobe Enclave Community Trust, which began in 1993 and derived revenues from hunting and photo safaris (Jones, 2002). The CBNRM

framework in Botswana is based on registered community-based organizations (CBOs). The Botswana CBNRM status report indicates a total of 94 legally registered CBOs existed in 2006 (IUCN, 2006). The program covers the entire country; more than 100 villages with more than 135,000 people are involved in CBNRM. Most CBOs, certainly the ones with high revenues, are located in northern Botswana around the tourist destinations/attractions of the Okavango and Chobe/Zambezi rivers. The oldest and largest CBO dealing with veld products is KgetsiyaTsie (KYT) (USIAD, 2007b). A CBNRM Support Program started in 1999 as a joint initiative of International Union for Conservation of Nature (IUCN) and the Netherlands Development Organization (SNV) and was later supported by the World Wide Fund for Nature (WWF) (2004-2006). In the 1990s and 2000s the CBNRM program in Botswana experienced a boom in registered CBOs.

USAID (2007b) claimed that revenues from commercial resource use were estimated to be P19.3 million and subsistence activities generated P16.2 million in-kind income in 2005 alone! Trophy hunting is the most important commercial activity (P11.9 million) followed by tourism (P3.1 million), sale of veld products (P0.7 million), and crafts (P0.6 million). In terms of employment generation, USAID reports that CBNRM employment is modest with an estimated 800 jobs, roughly two-thirds of which are located with the joint venture partners (520) and one-third with the CBOs. The USAID report also denotes that the CBNRM indicators show that the overall development impact of the program is limited. Around 1.2 percent of the adult population in CBNRM areas is employed through CBOs or joint venture partnerships (JVPs). The CBNRM benefits translate to a modest amount of around P240 per person per year. This figure, however, falls far short of CBNRM potential in contributing to community benefits and better livelihoods of the people. The problem here like in other southern Africa countries is lack of evaluation of what works and what does not work in CBNRM programs. Overall, the CBNRM program in Botswana has rapidly grown in the past two decades and diversified its natural resource base (wildlife, veld products, tourism, rangelands, and rural development). But then, this has not fully contributed to rural development and sustainable livelihoods. Nonetheless, Mbaiwa (2004) argued that CBNRM in the Okavango Delta has succeeded in terms of income generation, employment creation, the establishment of local institutions meant to ensure local participation in NRM, tourism development, and determination of economic valuation of natural resources.

Namibia

In Namibia, CBNRM informally commenced in the late 1980s with the formation of the Integrated Rural Development and Nature Conservation (IRDNC) project. This initiative was based on the experience of a community game-guard system and also on the need to combat poaching and procure wildlife-tourism benefits for local communities (Jones, 1999). After the independence in 1990, IRDNC assisted the newly established Ministry of Wildlife, Conservation and Tourism (now the Ministry of Environment and Tourism or MET) in conducting socio-ecological surveys in several game areas (Child et al., 2001). The findings of the study showed that local people needed incentives to become involved in utilising their resources sustainably. Thus, CBNRM became a policy goal. However, funding was needed to implement these recommendations. In 1993, the Living in a Finite Environment (LIFE) Program was launched, administrated by WWF-US, and supported by USAID and the Namibian government (Jones & Mosimane, 2007). A LIFE Steering Committee (comprising membership of several Namibian NGOs) helps in directing the initiative's activities. It is instructive to note that Namibia's CBNRM programme is institutionally strong, having a well-integrated government co-ordinating body and several strong Namibian NGO support providers (USAID, 2007a). However, some reservations are expressed in

certain quarters that the legislation is not comprehensive; the initiative translates poorly into action; there are communication failures on the part of government agencies; and more NGO expertise is needed. In spite of these seeming shortcomings, Namibia's programme comprises the basics of a national CBNRM movement, which makes the consequent process of participation for communities easier (Jones & Mosimane, 2007).

With progressive government policies, well-co-ordinated networks of service organisations and community-based tourism enterprises, and several capable NGOs either established or being improved, Namibia's CBNRM program is well structured and effective (USAID, 2007b). In Namibia some innovative strategies have been utilised. These include the Community Game Guard (CGG) and Community Resource Management (CRM) systems, employment of business advisors, games for capacity-building and facilitation, and a well-constructed tourism training programme. But all this does not suggest that there is no stumbling-block in implementation of the program. For instance, problems associated with land tenure rights remain unresolved, basic education is still needed to enable the majority of conservancy members to effectively acquire NRM skills, and co-ordination and service provision still need some improvement. However, Namibia has a strong basic structure of CBNRM activities and implementing organisations, which with a few more years of experience, should see the programme through the withdrawal of donor support (Jonesand & Mosimane, 2007).

Zambia

The Zambia's National Park and Wildlife Service (NPWS) now (Zambia Wildlife Authority, ZAWA) convened the Lupande Development Workshop in September 1983 to discuss management strategies for combating the extreme poaching problem prevalent at the time (Jones et al., 1998). The Lupande Research project, examining elephant management outside of the South Luangwa National Park, highlighted the need to involve local residents in environmental conservation projects and was the catalyst for CBNRM in Zambia. Jones and his colleagues further report that two initiatives resulted from that workshop: the Luangwa Integrated Research and Development Project (LIRDP) and the Administrative Management Design (ADMADE) for Game Management Areas (GMAs). It is noteworthy to mention that Zambia's CBNRM program, especially ADMADE, is unique in the region for being a largely indigenous initiative. Essentially, the Zambian government directs the efforts while donor funding and NGO involvement have been somewhat limited (Jones & Mosimane, 2007).

Zambia's CBNRM is also different because of the severely limited infrastructure in rural areas; a large portion of benefits received is expended on physical development like roads and schools. Zambia's CBNRM (i.e., ADMADE) differs from other programmes in the region in that it is largely a local initiative. After the initial five-year grants, WWF and USAID's aid was not renewed, and USAID now only assists with some seed money for vehicles and Nyamaluma's[1] running expenses (USAID, 2011). ADMADE covered 80% of its own costs (USAID, 2007b). Rather than being a donor-driven project for the sake of community governance and wildlife conservation, ADMADE was established because NPWS lacked the funds to effectively manage natural resources in communal areas. Local community people who are knowledgeable, ever-present and serve as cost-effective "employees" were enlisted to help after being trained at Nyamaluma. Thus, ADMADE had consciously focused on hunting safaris for its sizeable rate of returns on low inputs. Money earned is divided into a 40% : 35% : 25% sharing formula. The largest percentage (i.e., 40%) is returned to the GMA for actual wildlife management including village scout salaries, vehicle running costs, and conservation monitoring activities. The 35% is given to local communities strictly for self-directed development projects like schools, clinics, roads, etc.,

[1] Nyamaluma is one of the Zambian communities where CBNRM is being implemented.

and other basic infrastructure, which the government has not been able to provide in rural areas. The remaining 25% goes into the Wildlife Conservation Revolving Fund housed by ZAWA. This money is being used for ADMADE administration costs and as capital replacement in units that are not yet self-sufficient (USAID, 2007b). As the information contained on Zambia's CBNRM is rather scanty, not many conclusions can be made about the national programme. Nonetheless, ADMADE catches attention for its inward looking attribute, local content, and very near self-sufficiency (in terms of funding) in the region. This avails it as quite a unique model of some sort. Already, steps are being taken to improve its democratic structures and devolve benefits to communities. Several other organisations are becoming involved in CBNRM. And fisheries as well as wetlands—rare in the rest of the region—are being targeted. Indeed, SNV is one of the few organisations actively working in the field with fisheries and forestry co-management schemes (USAID, 2011).

Strengths and Weaknesses of CBNRM Programs in Southern Africa

As earlier observed, CBNRM programs and projects have been in existence in southern Africa since the 1980s. While their unique blend of environmental, economic, and social potentials have been recognised and acknowledged, there exist some successes and failings of these initiatives, which cannot go without mention.

For instance, CBNRM activities in Botswana present mixed results. Some of the CBNRM projects (e.g., in the Okavango Delta) have collapsed, while others have succeeded and have significantly benefited participating villages economically (Mbaiwa, 2010). Mbaiwa (2011) provided an example of the Sankoyo Village CBNRM project (involving photographic and safari hunting tourism) as a success story in terms of generating benefits such as income and employment opportunities. One of the facts emerging from the review of CBNRM in Botswana (2003) is that the initiative has significantly improved the communities' appreciation of the value of natural resources. Specifically, there has been an acute shift of attitudes towards natural resources, particularly wildlife as a result of the CBNRM orientation. Prior to the implementation of the CBNRM programme, most communal natural resources had fallen prey to the so-called open access, where the use of resources was not controlled. This applied to most veld products that were not regulated under the 1974 Agricultural Resources Conservation Act, and for communal rangelands in the proximity of villages that were not controlled by private borehole owners. However the main problems in Botswana's CBNRM are fund mismanagement by CBOs, increased devolution of rights, and lack of capacity building for the CBOs (National CBNRM Forum, 2005).

In Namibia, CBNRM has made a considerable difference in the protection and recovery of wildlife species such as the desert-dwelling black rhino and elephant. Due to conservation efforts through CBNRM, there are more huntable games available for community use, sales to trophy hunters, and live sales which have contributed to better community livelihoods. CBNRM has also promoted wildlife and tourism as a way of using land in communal areas and demonstrated the economic value of these resources to the national economy (Boudreaux & Nelson, 2011). Private enterprises' contributions to the national economy are conservatively estimated at US$5.5 million. These include turnover of joint venture lodges, sustainable trophy hunting, thatching grass, and other direct income sources. Tourist lodges, camps, guide services, and related businesses such as handicraft production employed 547 full-time and 3,250 part-time workers. In some regions, it is estimated that conservancies directly provided 28 percent of area employment in 2003 (USAID, 2005).

Namibian communities have benefited greatly from conservancies. Income has increased from about 500,000 Namibian dollars (1996) to more than 14 million (US$2.5 million) in 2004. About half of this constituted

direct cash dividend or social programs (such as school improvements, new water pumps, or diesel fuel for operating pumps). The additional benefits were earned by individual households through wages from conservancy-related jobs and enterprises. In the Kunene region, a 29 percent increase in per capita income has been recorded due to the combination of direct and indirect effects of CBNRM, suggesting a significant role for conservancies in alleviating rural poverty (USAID, 2007a). However, many problems still remain. Firstly, the enormous growth of registered conservancies has meant that government and NGOs are finding it difficult to provide enough managerial and technical support to them (USAID, 2007a). Secondly, over-reliance on external aid has been identified as a major challenge; donor organisations have made a significant contribution to helping conservancies get off the ground through the provision of management and technical training as well as buildings and equipment (USAID, 2007a). Whether these conservancies will last and demonstrate that CBNRM is able to support directly the livelihoods of rural communities in the long term is not yet known.

In Zambia, the rights to benefit from wildlife have improved over the past years due to CBNRM activities, which also attempted to address issues of rural poverty and unemployment in order to gain local support for natural resources conservation. In the past, local communities were alienated from benefiting from natural resources, including land. Current legislation now has provisions on community rights to benefit from natural resources. The Zambia Wildlife Act No. 12 of 1998 allows greater participation of local communities, thus establishing their rights to use and manage natural resources in GMAs and Open Areas. This includes provisions for local-level participation in developing management plans (USAID, 2011) for development purposes. The elephant population in the Luangwa Valley, which was the focus of conservation efforts at the genesis of CBNRM, shows positive growth since the inception of the initiative. CITES (2010) reported that the Luangwa system now supports the majority of Zambia's elephant populations that have been increasing and, which now currently stand at 18,634 ± 3,592. This constitutes 72% of Zambia's elephant populations and is a significant increase from the estimated population of about 9,000 in the early 1980s.

However, the challenges to Zambia's CBNRM include failure by many of the stakeholders to acquire and utilize indigenous knowledge; inadequate legal framework to support benefit sharing with respect to forest resources; and overall benefits to local communities are insufficient. Advocacy by civil society will play a critical role in strengthening the policy and legal framework that govern natural resource use and management. Due to inadequate revenues accruing from wildlife resources as a result of government involvement, which wields the greater control, households do not receive direct dividends from wildlife management. Yet, direct dividends imply revenue sharing as compensation for living with a resource and bearing the costs associated with it.

In summary, on the one hand, the success stories (i.e., those aspects of CBNRM that have worked) abound in all the countries. These include reduction in wildlife poaching and improved local community attitudes towards wildlife and natural resources; increased wildlife; community development especially in rural areas; contribution to improved community livelihoods; and increased conservation of natural resources.

On the other hand, those aspects of the initiative that have not worked (i.e., daunting challenges) include: mismanagement of funds by CBOs; lack of full support from national governments in terms of funding—a lot of CBNRM have relied on partnership with donor agencies; lack of technical skills for the CBOs; uncoordinated linkages with other developmental programs; and dearth of policies, which incorporate CBNRM programs in the overall national development plans.

Tourism and Rural Development: Do They Interface With CBNRM and Poverty Alleviation in Southern Africa?

CBNRM is an incentive-based conservation philosophy that links conservation of natural resources with rural development (Blackie, 2006; Mbaiwa, 2010; Swatuk, 2005; Thakadu, 2005; Twyman, 2000). The basic assumption of CBNRM is that a community will manage its natural resource base sustainably if it gains direct benefits arising from its use. The failings of centralized approaches to NRM in a bid to arrest irretrievable losses of these natural endowments around the world during the colonial and post-independence periods led to a search for an alternative CBNRM regime. From tourism perspective, tourism literatures since the 1980s, have made advocacies for the inclusion and involvement of local communities in tourism as local residents are seen as a key resource in sustaining the product (Hardy, Beeton, & Pearson, 2002). Community participation is often regarded as one of the most essential tools of tourism business if the industry is to make any substantial contribution to the national development of a country (Lea, 1988). Therefore, there exists a veritable interface among tourism, rural development, and CBNRM. For some, community participation in tourism ensures environmental sustainability (Woodley, 1993), better opportunities for local people to gain benefits from tourism taking place in their locality, positive local attitudes and the conservation of local resources (Tosun, 2006). Participation is emphasised at the local level to facilitate physical development, the inclusion of community wishes in tourism planning and development and to ensure economic returns from the industry (Murphy, 1985).

Although CBNRM was initially set up as a conservation approach, the rural development aspect of the initiative has become more prominent (Arntzen, Setlhogile, & Barnes, 2007). It is based on the common property management theory which discourages open access resource management; it promotes resource ownership, control, and use by local communities (Rihoy & Steiner, 1995). In Botswana, CBNRM is seen as a development approach that supports natural resource conservation and the alleviation of poverty through community empowerment and the management of resources for long-term social, economic, and ecological benefits (Government of Botswana, 2000). The utilization of natural resources through CBNRM can lead to several benefits, which are interrelated and help to address different needs within a community. The creation of employment is one of the most important strategies to alleviate poverty as well as bring social security in the lives of the people resident in remote areas. Other benefits apart from employment can come in a variety of forms: cash disbursement, self-reliance of community projects, local empowerment, enhancement of self-esteem and confidence, strengthening of the village identity and culture. The community-based approach to NRM is premised upon its ability to alter local behaviour and practices in ways that conform to the attainment of pre-determined conservation and community development goals (Gibson & Marking, 1995).

CBNRM in the Okavango Delta

The Okavango Delta of Botswana is a vast inland delta system that receives an annual flood from the highlands of southern Angola (see Figure 2). It fluctuates in area coverage from 15,000 km^2 during the flood to 6,000-8,000 km^2 during the dry season. Geologically the Okavango is a young system (approximately 10,000 years old), which before major geologic uplifting formed a drainage channel into a great lake called the Makgadikgadi (Merron, 1991). Although CBNRM in the Okavango Delta is noted to have made some positive impacts on poverty alleviation and people's livelihoods, it has also been criticised by different scholars for its several weaknesses (Mbaiwa, 2011). Swatuk (2005) and Blackie (2006) argued that CBNRM has not realized its

objectives of conservation and rural development. Instead, it has been used as an instrument by donor conservation agencies and governments of industrialized countries to perpetuate the global domination of developing countries. While Taylor (2000) noted the relegation of minority groups such as the Basarwa of Gudigwa from deriving benefits from CBNRM, Twyman (2000) argued that CBNRM in Ngamilaland[2] is not fully developed to yield significant benefits to residents. Despite these criticisms, CBNRM in the Okavango Delta is one approach that is introducing local participation and benefits from tourism development, particularly in rich wildlife areas (Kgathi, Ngwenya, & Wilk, 2007; Mbaiwa, 2004; 2011). While this may be the case, available studies on CBNRM in the Delta have not adequately shown the contribution of CBNRM to rural development (L. I. Magole & L. Magole, 2005; Mbaiwa, 2005; 2011; Thakadu, 2005).

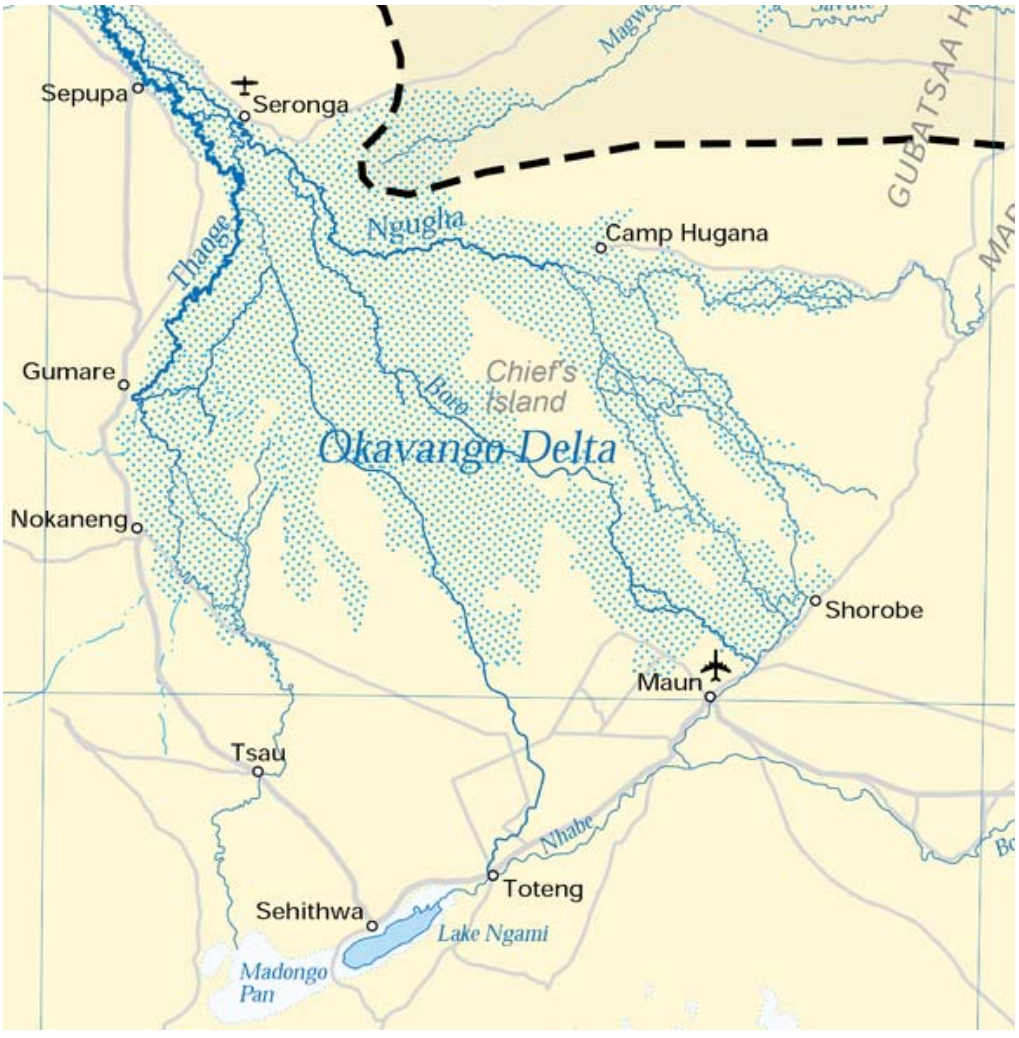

Figure 2. Map showing the Okavango Delta of Botswana. Source: Wikipedia (2014).

Local Knowledge, CBNRM, and Tourism in Southern Africa

Within addition to the attention given to participation at the local level, there is now a growing focus on the role and importance of culture and local knowledge (also known as indigenous or traditional knowledge) in the

[2] Ngamilaland is a district in north-western Botswana where CBNRM program looms large.

development process (Kolawole, 2001; 2009). While on the one hand, this has led to an understanding of the cultural foundation and context for local natural resource management and the importance of local knowledge for CBNRM activities, culture and local knowledge on the other hand, are now increasingly used as a tool for organizing local people around specific CBNRM activities. Local knowledge also addresses local natural resource management regimes, including traditional rights to natural resources (Lars, 2001).

The 1998/1999 World Development Report affirms that knowledge, not capital, is very crucial in sustainable social and economic development. Building on local knowledge, the basic component of any country's knowledge infrastructures, is the first step to mobilize such capital. Therefore, development activities, especially those that aim to benefit the poor directly need to prioritize local knowledge in the design and implementation stages of the process (World Bank, 1999). Madzwamuse and Fabricius (2004) argued that local knowledge in the management of natural resources in Botswana by the Basarwa and other indigenous communities has until recently been ignored. But the commitment and relatively recent inclusion of local communities in the management of natural resources show how governments are appreciating local knowledge. Knowledge of society and of community plays a very important role in the development process because it ensures the stability and invulnerability of traditional social relations. World Bank (1999) opined that indigenous knowledge is an important component of rural poor people's life. It is an integral part of the local ecosystem. Local knowledge is a key element of the "social and human capital" of the poor; their main asset to invest in the struggle for survival, to produce food, to provide for shelter, or to gain control of their own lives. Local knowledge also provides problem-solving strategies for local communities and helps shape local visions and perceptions of environment and society (Warren, 1990; 1991).

It follows then that rural tourism, CBNRM, and local knowledge are not mutually exclusive. Local knowledge is important for both the local communities and the global community. Development workers/partners need to recognize the role of local knowledge, understand its workings in the context of the local communities, and systematically integrate the effective and promising aspects of such practices into development programs such as CBNRM (Manyozo, 2010; Kolawole, 2009).

Concluding Reflections

Some general conclusions are drawn from the issues raised in the paper. In most part of southern Africa, natural resources and tourism currently provide the opportunity to generate the highest financial benefits compared to other resources. But the benefit to households' remains low and the cost implications of living with natural resources (wildlife) remain high while community proprietorship over natural resources remains weak.

This situation arises mainly through the way in which CBNRM programs have developed in the region. The main conceptual foundations of CBNRM—economic incentives, devolution, and proprietorship have only been applied in part. Governments prefer co-management and revenue sharing approaches where they retain a high degree of control over natural resources and a large share of the income from its use. Governments still play a major role in decision-making regarding the use of natural resources and in many cases usufructs are conferred by administrative decree and management agreements rather than through a rights-based approach entrenched in legislation. As a result, many CBNRM activities in the region demonstrate characteristics of co-management rather than largely autonomous community management.

Nevertheless CBNRM as a strategy for rural (tourism) development proves to be a veritable instrument for achieving community well-being in southern Africa. Nonetheless, there remain numerous but pertinent issues

that need to be addressed. These include amongst other issues, inconsistencies in law and policy, conflicts between community and private interests, unresolved imperatives of land reform, confusion around organisational roles, and responsibilities of the state. Others are limited training and capacity building for CBOs, insecurity of tenure, stakeholder conflicts, mismanagement of funds, and problems of how to use and equitably distribute the financial benefits to individual households.

It is, therefore, necessary for the CBNRM initiatives to focus on training in order to improve the participation of local communities in CBNRM initiatives. At the same time, there is need to carry out evaluation studies on changes in attitudes towards natural resources, and on the extent to which the CBNRM initiatives have influenced natural resources conservation. There is also a need to determine the extent to which CBNRM could contribute to rural development with a view to enabling proper and adequate development planning. Household benefits and income generation apart, emphasis needs to be placed on local-level governance of CBNRM institutions and skills development, which are essential components that are often overlooked in development practice.

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Chinese Business Review, ISSN 1537-1506
December 2013, Vol. 12, No. 12, 807-813

Microfinance Structure of Thailand*

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This paper was devoted to analyzing the structure of microfinance in Thailand. The theory of industrial organization (IO) was applied as a guideline to measure the degree of monopoly power in microfinance structure. The objective of the study was investigation on Thai microfinance institution marketing structure by using Concentration Ratio (CR) and Herfindahl Hirschman Index (HHI). The data of the study focus on the outstanding loans market share of microfinance institutions (MFIs). The market share of the outstanding loans of MFIs from the largest to the smallest is as follows: Bank for Agriculture and Agricultural Cooperatives (BAAC), Village Fund Cooperatives, Government Saving Bank (GSB), Pawnshop, Self Help group: Saving Group, Commercial Bank, Self Help Group: Sudja Group and Isalamic Bank (IB), respectively. It stated that CR by outstanding loans is as follows: Cr 1, 59.35%; Cr 3, 81.11%; Cr 6, 92.14%; and Cr 9, 94.37%. At the same time HHI is 0.38. Additionally, BAAC remains the majority MFIs even though there are the other MFIs available in the microfinance system. The main role of providing the microfinance services mostly derived from BAAC.

Keywords: microfinance institutions (MFIs), market structure, Concentration Ratio (CR), Herfindahl Hirschman Index (HHI)

Introduction

The significant cause of the poverty in the rural area almost every country all over the world is the low income people who have no ability to access the formal commercial bank loans. Due to lack of collateral and have unstable income sources (Armendariz de Aghion & Morduch, 2005, p. 4), in addition, they were held interest at rates so high that became in the cycle of debt. The assistance for those who have low incomes through subsidies or grants is not the right approach and sustainability. Small financial systems which called microfinance have been developed continuously to meet the needs of the low income people who mostly can not access the other financial sources.

Nowadays, the small enterprise finance in the financial system is growing obviously. Many activities focused on providing financial assistance to people living in the community. These activities vary between the environments in the local traditions. Each group established by the common members accompany their trust is managed without a collateral when making lending transaction. These groups that have a strong innovative social management create aspiration to the wider outcome than financial results, such as improving the quality of life and moral development.

As mentioned previously, the opportunities to access the financial sources from formal commercial bank

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whether it is a saving or credit in the financial markets for the grassroots groups who are low income are quite limited. However, the groups have a chance to use the services from the state financial institutions—the Bank for Agriculture and Agricultural Cooperatives (BAAC). Besides, the established own funding sources in the community which derived from their own innovation. Because of the low income population, mostly living in rural areas and agricultural occupations or general contractor can be seen. There are various forms of cooperatives including the establishment of a community organization, such as financial savings groups.

Actually, the amount of deposits and credits of microfinance system is the half of the savings and loans in the commercial banking system approximately 1.8 to 2.0 trillion, while the number of deposits and loans of the banking system is at 6.5 trillion baht.

The structure of microfinance systems relys on the theory of industrial organization (IO): IO applied as a guideline. The behavior of the organization's financial statements reflects the image of the structure and the organization, and vice versa, it will be structured and organized to reflect the same behavior.

The relationship between the market structures inevitably affected the microfinance behavior and the performance of financial organizations. These relationships contain the basic organizational structure, financial, and other factors. Behavior and performance of financial organizations with all components are an incident simultaneously. Both of behavior and performance will result with the structure conduct operations. The operation perhaps may be distorted by the intervention of the public policy of the state. On the other hand, the structure of the organization can determine the behavior and control the results of operations.

Fundamentals of corporate finance needs have forced financial stability to relate with the stable community among the requirements which include the low interest rate loans for livelihoods and spare expenses in case of emergencies. While gaining the appropriate return on savings in the form of interest in addition have various welfare, the microfinance institutions (MFIs) have to keep balanced with the momentum caused by these factors as the driving force for strengthening economic and social development of the community, moreover, increased bargaining power of social and business caused by the lack of opportunity to secure the services of formal financial institutions

However, the adequate of capital to finance the operations of the members on the financial size of the community has done more to expand its services to community. By more financial transactions to meet the needs of members the MFIs are necessary such as loans to members.

The financial structure of the organization is the result of the behavior of the MFIs. For the purpose of community organizations focused on enhancing the financial well-being of their members. As a result, the behavior of the MFIs encouraged to be the center of economic and social activities, such as participation in the development. It also serves deposit services to their members. Supply of loans serves for assistance funding to member for mobilizing their job as well the emergency expenses addition to counseling support and career path development. All of activities and funding have aim to share the knowledge and production techniques among members. The financial structure of the organization which defines the behavior of corporate finance community also affects the operation of the MFIs. The ability to mobilize savings which is the main factor of the financial transactions among the various financial organizations achieves is the objectives of the MFIs. Saving which encouraged by the MFIs plays the important role of mobilizing the sources of fund. These funds transform to be deposit that MFIs have to pay interest rate to depositor. The incentives of deposit's interest rate stimulate the member to add more funds to MFIs. Most of funds were used to be loans among members. The use of fund is the sources of profit for MFIs (Branch & Janette, 2002, p. 14). These are incentives for members to bring savings to

the organization which is the capital of the nonprofit organization's MFIs (Federic, 2006, p. 15). Besides, it concerns of the share of profits paid to members in the form of dividend.

Generally, the operation of the MFIs will be able to achieve the objectives. It affects from the various types of factors that determine the success of organizations such as management team conduct of the MFIs efficiency in funding management government policy.

However, the behavior of the structure and operation may be affected by factors outside the MFIs which cannot be avoided, such as the rules and regulations of the government agency or agencies related to the MFIs. According to the assistance from the intervention of government policies such as technical support and management for an organization with a strong and reliable service to the community, sometimes, aided financial loan at low interest rate as a tool to spread prosperity to the local level (Bratton, 1986, p. 8).

External components can cause distortion of the behavior and operation of corporate finance community. The behavior of the MFIs which participate in the development and generate human well-being within the economy and the release of community suffering demonstrates success in microfinance purposes (Edgecomb & Barton, 1998, p. 12).

The benefits of MFIs perfectly have limitation within the members in the community. That is the result of increase and number of members within the community. As a consequence to the strength of the organization, participation of its members, a sense of ownership of the organization, and trying to become the committee or monitoring of all committee can determine the organizational structure in the MFIs. Then when there is a response to the increase in the membership it will result in more competition and the emerging of corporate finance. The direction of such components may not be in the direction of the structure, behavior, and performance. It may be concluded that financial structure does not necessarily lead to behavior change direction to the operations of the MFIs. The structure of the community is different. This difference will determine the nature or the market structure of the MFIs and the management within the communities. Difference of the behavior determines the framework of the organization and reflects the quality of service and participation in social behavior. However, they may be distorted by the intervention of state policy (Ghatak, 1999, p. 26).

The Definition of Microfinance

The Asian Development Bank (ADB) defines the meaning of microfinance as follows: "The provision of financial services in the scope is broad. These are covered financial services including deposit, lending, and insurance payments to the poor and low-income households throughout the retail enterprise" (Asian Development Bank, 2000, p. 2).

There is an assortment of microfinance services by source of funds for the implementation which can be divided into three categories:

(1) Formal financial institutions (formal institutions) including bank rural government projects and various cooperatives;

(2) Semi-formal financial institutions (semi-formal institutions) and Non-Governmental Organizations (NGOs);

(3) Unofficial financing sources (informal sources) including lenders and shop owners.

Theoretical Concepts

IO

Theoretical concepts used in the study employed the framework of the theory of IO to study the structure

of the microfinance.

In general, the structure of the market determines the behavior of the industry. The measurement of the degree of monopoly power is considered by the concentration of the industry, obstacles of new operators, and the differential products or services. These basic components are able to assess how the market characterized as some kind of market where lay at the degree between the competition and monopoly.

The concentration of the industry defined as the ratio of the share of incumbents in the industry. The study of the industrial concentration demonstrates the influence of business on the market. The instrument for measuring the industrial concentration has several tools which depend on the nature of the data available and the desired target. This study employed the outstanding loans to be the data characterized the monopoly power in the microfinance market by the Concentration Ratio (CR) and Herfindahl Hirschman Index (HHI)

Background of Thailand

Office of National Statistics indicated that there are 63 percent of the country's population (41 million people) living in rural areas, 92 percent of these households have a career in agriculture although productivity in the agricultural sector will account for 11 percent of gross domestic product (GDP), but the yield of these basic materials that feed into large agricultural industry of Thailand. This accounted for 25 percent of total exports of the country. For rural households, the remaining eight percent are employed. Most of total labor forces have worked as unskilled workers in the manufacturing sector construction and transportation.

In the area of small and medium sized enterprises (SMEs), data from the Bank for Small and Medium Enterprises Promotion indicated that the country has about 1.87 million registered business entities. The amount of small enterprise, 99 percent, was classified as SMEs which employ roughly 80 percent of non-agricultural employment. The output was 42 percent of GDP or 38 percent of total manufactured exports of the country. During the first quarter of 2009 there was approximately 10,000 new SMEs registered. These SMEs have inability to access loans. Bank of Thailand (BOT) has estimated in early 2009 and only one third of this number has access to credit in the system.

Report of the Office of the National Economic and Social Development Board (NESDB), the year 2007 demonstrated that incomes below the poverty line earning were less than Baht 1,443 per month (using the criteria of the United Nations at 1.25 U.S. dollar per day), representing 14 percent of the gross national product (GNP), GNP per capita in Thailand is 10,043 baht per month indicating that the number of poor declined steadily. The population of Thailand in 2007, approximately 8.5 percent (5.5 million people) had incomes below the line to the northeast of the country, and approximately 18 percent of the populations in the country (12 million people) were classified as the poor in the city.

Thailand remains the economy that is dependent on the commercial banks (bank-based economy) and the public sector is still mainly relys on banks as a source of funds for the financial services business. The results of the year 2007, the BOT showed that households and SME 9.61 percent are not able to access to financial services. As households that have access to the services of approximately 16.35 percent the number of households that do not have access to financial services may seem obvious relatively low. The results showed that there were a number of houses (33.93 percent). They were mostly lack of collateral and had no adequate condition to receive approval loan from the financial institutions.

One cause of the Asian financial crisis in 1997 was a result of the weakness of the financial sector. The country's financial reform plan was established in 2000 with a modified former version. Thailand at a later time,

the master financial plan level for Grassroots during the first five-year period (2008-2012) has been done for a part of the restructuring at this the financial period.

The BOT aims to boost financial business by increasing the foundation level, opportunities, access to credit, and other financial services to the low income. The possibility to access the services from the formal financial system is not enough, so the goal of the master plan during the first financial for grassroots aims to link the bank's service system to MFIs. It focuses on the semi-formal MFIs. This includes funds for cooperative village banks and savings groups. This link will activate the banking system in which the funds exist but lack of customers. This strategy turns their attention to expanding access to financial markets in the foundation level. By using the historical data of customer financial cooperatives and savings groups are available for recruiting the newcomer customers who stay in the village and community.

Currently, the Ministry of Finance is considering the ways of providing financial services to the low income level in the following three formats:

(1) Give permission to the experienced foreign investors to start microfinance activities;

(2) Allow commercial banks to be the partner with third party microfinance experts and foreign investors;

(3) Allow commercial banks to operate microfinance programs through separate entities, such as microfinance subsidiaries.

Thailand's financial market structure is relatively flat. The segmentation is quite clear. They are powerful enough to move the deposit mobilization including the distribution of funds to the rural and agricultural sector. The size of the microfinance market may not be large. The government played a major role as a service provider. From this action of government, it makes the policy maker not to pay attention to setting up the regulations of the financial services at the foundation level for non-government MFIs and small MFIs organizations. Hence, the level of private foundations and NGOs is so small and focuses on specific target groups such as urban industrial workers, HIV patients', hill tribe minorities, or immigrants. Typically, these programs will run separately and there is hardly coordination between the other organizations.

Ministry of Finance classified the foundations of the MFIs into three major groups including:

(1) Banks and non-banks that operate under strict financial laws (prudential regulations) including corporate finance. Statements of government as Government Saving Bank (GSB), BAAC, and Islamic banking etc.;

(2) Small financial organization means an organization that established by legal registration (non-prudential regulations). These organizations have purposes to promote savings and investments in the community including various cooperatives both inside and outside agriculture, savings to the manufacturer as well as the villages and hamlets;

(3) Microfinance organization which operates within the community members not under the law. These organizations were established to promote savings and provide credit to the members of the general community. These small financial organizations arising from the support of external agencies include NGOs or government agencies, local or the developers, most of whom are serving in a village bank and loans to the group members (solidarity group).

Data and Analysis

This research will analyze the structure of the organization operating the financial entities in the financial system by considering the outstanding loans of MFIs which can be analyzed in the following part.

To examine the monopoly power of MFIs, a measurement of concentration ratio should be established.

Certainly, all MFIs are divided into three types: formal, semi-formal, and informal.

From Table 1, the overall outstanding loans of microfinance providers is 888,934 million baht, at the end of 31 September 2010, while the largest proportion is 577,871 million or 68.88 percent worth of outstanding loans come from the formal MFIs providers. As 27 percent as outstanding loans worth is semi-formal MFIs providers. The remaining four percent composes of independent groups include group savings self help group.

Table 1

Amount of Outstanding Loans

MFIs providers	Outstanding loan (Million Baht)
Formal	577,871
Semi-formal	227,263
Informal: Self help group	33,800
Total	888,934

Note. Source: Ministry of Finance.

According to IO: By analyzing paradigm, the market structure affects performance. Then, we analyze the structure of microfinance in this section. The using of CR and HHI is presented as the index is calculated by the concentration of the MFIs.

$$C = \sum_{i=1}^{n} P_i$$

C = Proportion of CR 0-1;

P_i = Market share of i;

n = Amount of microfinance institution ranking from largest to smallest.

$$\text{HHI} = \sum_{i=1}^{n} \left(\frac{Yi}{Y}\right)^2$$

HHI = Herfindahl Hirschman Index;

Yi = Marketshare of MFIs;

i = 1, 2, 3, …, N;

Y = Total marketshare.

From Table 2, concentration ratio 1 is 0.5935, the ratio of the concentration, calculated from the value of outstanding loans of the main operators in only one institution (Cr 1) which shows the strong level of monoply. Moreover, the HHI was found to have a higher tendency to concentration as well which equals 0.38 obviously.

Table 2

CR

CR	Ratio
Cr 1	0.5935
Cr 3	0.8111
Cr 6	0.9214
Cr 9	0.9437

Note. Source: Author's own calculation.

From Figure 1, the BAAC is a financial institution for rural development having main role as an essential mechanism in providing micro financial assistance to farmers and farmers' institutions and promoting a better

quality of life for farmers. Meanwhile, other MFIs employed minority role in lending to the low incomes people. As a matter of fact, the government has used the BAAC to be played as a major role of development in Agriculture Sector. It fills the gap voided by troubled banks and finance companies as well as to stimulate the battered economy, especially at the grass root level to receive the loans and other financial services. From the concept of "microfinance" it refers to a range of financial services provided to poor clients who are typically underserved by other financial institutions.

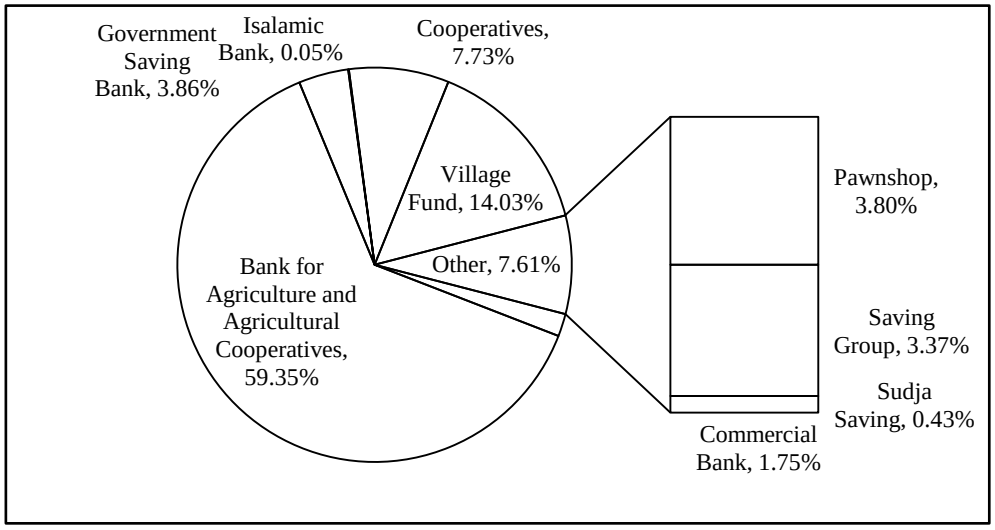

Figure 1. Marketshare of microfinance institution by outstandings loans.

Conclusions

Microfinance systems can be a tool to help solve the problem of poverty in the country which has a sustainable footing. Within the meaning of Asian development in microfinance, the financial services for the poor are basic such as deposits and loan payments, transfer money which give the chance for the poor and low income households, as well as providing financial services to small enterprises, this study found that BAAC remain the majority MFIs even though there are the other MFIs available in the microfinance system. Because the government encouraged the main role of providing the microfinance activities through BAAC.

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Chinese Business Review, ISSN 1537-1506
December 2013, Vol. 12, No. 12, 814-820

Azerbaijan is in the TANAP, TAP, and South Stream Project Triangle at the Deadlock of Nabucco

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This study has been investigated some pipeline lines after collapsing process of Union of Soviet Socialist Republics from Azerbaijan to Europe and another alternative ways from Russia. As we know Russia is a big power as from economic, defensive, and political aspects, as that's in ruler position in the region. So, USA from another side of the world as a super power of the world could make dimension of those pipelines from transit of Turkey. That's why new Nabucco project has been also cancelled by Russia's power. This article has been studied newly established project of Trans Anatolian Natural Gas Line Project (TANAP) from Azerbaijan's oil and gas department, Ministry's State Petroleum Company's (SOCAR) project has not been cancelled by Turkish Petroleum Company (TPAO). So TANAP's advantages and disadvantages have been researched in this article.

Keywords: Azerbaijan, Nabucco, Russia, State Petroleum Company (SOCAR), Trans Anatolian Natural Gas Line Project (TANAP), Turkey, USA

Introduction

The famous French writer Claude Farrére was writing those for Cengiz Han: "The wonderful human, who conquered Mongolia, Russia, Poland, half of China, Iran, some part of Europe and half of the Anatolia, was appointing secondary officers for this job. He himself was interested in transport roads and general order" (Farrére, 2001, p. 163). The transport roads, which were compulsory for conquering countries in the era of Cengiz Han, have gained vital importance for trade in subsequent periods.

It has been mentioned in the sources that the big road of the Silk Road was called the King Road, where merchants and caravans from every nation pass through, being referred as et-Tarîku'l-Harîr in Arabic sources, as Great Silk Road in English works, as Jamb in Mongolian. The Silk Road is the biggest one among historical main roads used by large caravans for long times on the earth, by connecting to large trade roads referred with different names at south and north

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directions. (Kirpik, 2012, p. 174)

Those who controlled this road had dominated both East and West for many years as in the example of Ottomans.

We come across the Road again with regard to the superiority of West over East. The Western States particularly Portugal, Spain, England, and France, which could not go to East due to pressure of Ottomans, had achieved these via sea. It would not be wrong to say that the capital obtained from these trips has been the most important factor in arising of Industrial Revolution, and the Industrial Revolution has also brought up the energy need increasing each passing day and the cheapest transportation of it in parallel to this.

The first pipe line transportation was used in Russia for the purpose of offering oil in 1863. This was initiated by the proposal of Russian inventor and chemist Dimitri Mendeleev. The pipe line transportation was pioneered by Vladimir Shukhov and Branobel Company near Baku between 1878-1880 (Kocakaya, 2013, p. 9).

Approximately, the pipelines passing and going to pass through Turkey which is a geographical bridge between Europe and Middle East and Middle Asia Countries having 40% of world natural gas reserve and 67% of world oil reserve, are of international importance (Yilmaz, 2005, p. 6), and the authors will try to compare Nabucco project with Trans Anatolian Natural Gas Line Project (TANAP), Trans Adriatic Natural Gas Pipe Line (TAP), and South Stream projects with advantages and disadvantages in this study.

What Is the Nabucco Project?

Nabucco pipeline has begun with the agreement signed between governments on Monday, 13 July 2009 in Ankara. It is a long transition pipeline transportation project planned so as to carry natural gas to European Union (EU) countries over Turkey. It is mostly supported by USA and EU for the purpose of being an alternative to the distribution made from Russia which is in the position of largest natural gas supplier for Europe. It is alleged that it has been interrupted substantially upon Russia announcing in the middle of 2007 that would sign natural gas purchase contracts in large amounts with countries (Kazakhstan, Turkmenistan) which are major natural gas suppliers of the line in Middle East. However, the project has gained power when German RWE Company became an equal partner to the Nabucco Company in February 2008. It has been expressed that the positive view of USA administration on the project's future is still continuing although the natural gas production required for the line to be profitable at full capacity can not be supplied also from this country as a consequence of an embargo still imposed on Iran, give to rise to big question marks about the line's future. Nowadays, the project has been changed as to start from the Turkey-Bulgaria border by taking the name of Nabucco West.

The 1,329 km pipeline Nabucco West, which will start from Turkey-Bulgaria border, is an adapted version of Nabucco Pipeline Project announced previously as to reach Baumgarten region of Austria from Erzurum. The aim of the Nabucco pipeline is to reduce source dependence by increasing natural gas supply diversity delivered to Europe[1].

It is envisaged that Nabucco West would deliver to the Europe the natural gas taken by means of Trans Anatolian natural gas pipeline project from Shah Sea gas field depending on the decision to be made in 2013. It is expected to deliver 10-23 billion cubic meters gas via the line predicted to be completed in 2018. The line is also envisioned as a part of the Trans-Europe Energy Line of EU and EU funds have been utilized for

[1] Nabucco and TANAP merged (Retrieved from https://radikal.com.tr).

feasibility and engineering studies. The total cost is 4-6 billion Euros according to the initial calculations.

The line will connect both Central Asia and Middle East as gas lines by merging with Trans Anatolian project in Standja region of Bulgaria, the gas taken from Trans-Anatolian Pipe Line and will merge with Baumgarten an der March Line which is the main natural gas carrier line of Austria at the west end. The updated project route is as follows (Retrieved from http://www.nabucco-pipeline.com/portal/page/portal/en/pipeline/route):

- Bulgaria: 424 km;
- Romania: 475 km;
- Hungary: 383 km;
- Austria: 47 km.

Nabucco Gas Pipeline International GmbH Company was founded in Vienna in 2004 for completion of the project. Current company partners are as follows:

- OMV (Austria);
- MOL (Hungary);
- Transgaz (Romania);
- Bulgargaz (Bulgaria);
- BOTAŞ (Turkey);
- GDF Suez (France).

GDF Suez has been included in the Project in 2013 through buying shares from OMV, following the transfer of shares of German partner RWE to OMV. In the past, French Gaz de France, Total and German E.N Ruhrgas, RWE companies also expressed that they want to be partners. It is notified that the participation of Russian Gazprom might occur in the future according to the status of the project.

The Construction and Project Planning

Russia, which has been meeting the need of Europe almost alone and wanting to guarantee the continuity of this situation for many more years, is putting pressure on the Central Asia countries which are the largest suppliers of Natural Gas particularly in the future, with political and economic attempts in respect of selling their gases only to itself. Sometimes the uncertainty in political situations of these countries is making ineffective the interventions from USA and Europe in the long term, undermining the efforts intended for breaking the Russian dependence in oil and natural gas sectors especially necessitating high cost investment in terms of the investor. In case of starting the project in 2010, it was scheduled to be completed in 2013, and even if sufficient gas is supplied, it is predicted that it would reach 10-23 billion cubic meters by achieving the full capacity after 2018. The Nabucco West project will be carried out over the engineering studies which have been already completed on the classic Nabucco route of 3,900 km[2].

Meanwhile, Turkey wishing to be gas supplier without gas production rather than being a transit country in its territory, is waiting for strong support in this direction from Central Asia countries whose culture and language histories are common.

Reliable producers are surely needed for realization of the Nabucco project. A production agreement was signed which ends the process delaying the Turkish-Iranian Natural Gas Cooperation resulting mainly from

[2] Italian Saipem to perform Front End Engineering and Design services for Nabucco West (Retrieved from http://en.trend.az).

distrust of Iran State and wished by Turkey for a long time, before Turkish and Iranian governments on 15 July 2007[3].

The sales right of its production to other countries is also granted to Turkey which will operate one of the largest natural gas fields with approved presence in the world by the Agreement. Meanwhile, Iran finds the opportunity to increase the natural gas production which has been nearly come to a halt and to renew its technology without embargo. An agreement of great importance with regard to both countries has been signed. The agreement is expected to has a positive contribution in terms of diversification of the energy corridors on the future of EU. According to the statement of Nabucco Gas Pipeline International GmbH General Director Reinhard Mitschek, in case of a positive decision is taken by Shah Sea Consortium in June 2013, Nabucco West construction can be started in 2015.

Azerbaijan's Alternative Project Against Nabucco Is a TANAP

A new road map has been drawn by Azerbaijan for itself which will start to market the gas produced by itself in a near future and Nabucco's experiencing difficulty in finding resource and having cost problems with countries which are going to supply resources can be enumerated among the reasons why Nabucco has been cancelled, which has been on the agenda lasting for 10 years and yet not completed. Meanwhile at the cost problem, repayments have been planned with the gas agreements that will be signed but these agreements could not be signed. At the same time, the reason behind the cancellation of Nabucco project due to its high cost, the project has collapsed because English BP, Norway's Statoil, and Azerbaijan State Petroleum Company (SOCAR) companies believe that energy prices are high in Italy and Greece which is the route of the gas to be transported to Europe and so it will increase costs.

When we look at the TANAP project, it is being planned to transport 16-21 billion m^3 natural gas per year taken out from the Shah Sea upon the completion of pipe line project planned to be carried to Europe over Turkey. It is aimed especially to break the monopoly of Iran and Russia possessing the monopoly in Europe with this project. World Energy Council Turkish National Committee Chairman Süreyya Yücel Özden, in his assessment to the AA correspondent, said that it is important to explain clearly opinions of the countries which will supply the natural gas from Caspian region and will receive this gas and Nabucco has drifted into inconclusiveness due to the lack thereof. Özden continued such that:

> For years, it has been much talked about. Who will supply natural gas, and how many, how will it be carried, how will it be transported to Europe? Nabucco now has dropped from the agenda which had been on the agenda for 5-6 years because of these matters could not be clarified as required somehow and the coordination could not be established fully between the consuming countries and producing countries. Instead, Trans Adriatic Natural Gas Pipe Line (TAP) and TANAP pipe lines came to the agenda. First of all, the attitude of Russia concerning these issues should be paid attention. And also which country will give the natural gas here in what quantity, this natural gas to be sold to which countries in South Europe including Greece and how much, these are important.
>
> Özden, who stated that TANAP and TAP is going to be on the agenda instead of Nabucco, emphasized that it is required to take into account the economic crisis experienced by Greece among the countries took part in TAP. Özden, by stating that the selection of TAP and deactivation of TANAP are not important for Turkey, remarked that being selected of TAP instead of Nabucco is not a loss for Turkey. The important thing is TANAP's crossing over Turkey (Retrieved from http://www.aa.com.tr/tr/ekonomi/198695-onemli-olan-tanapin-turkiyeden-gecmesi).

[3] Iran-Turkey Energy Cooperation Agreement was signed, Hurriyet, 15 July 2007.

International Natural Gas Pipe Line Projects

International Natural Gas Pipe Line Projects include:

- Nabucco Line: Nabucco Line;
- Russia-Türkiye DGBH (West): Russia-Turkey DGBH (West);
- Turkey-Greece DGBH: Turkey-Greece DGBH;
- Greece-Turkey DGBH: Greece-Turkey DGBH;
- Mavi Akım: Blue Stream;
- Trans Hazar Hattı-Kazakistan: Trans Caspian Line-Kazakhstan;
- Ceyhan LNG Terminal;
- Shah Deniz Hattı: Shah Sea Line;
- Trans Hazar Hattı: Türkmenistan-Trans Caspian Line-Turkmenistan;
- Arap DGBH: Arab DGBH;
- Arap Gazı Hattı ile Mısır Gazı: Arab Gas Line with Egypt Line;
- Turkey Iran DGBH: Turkey Iran DGBH.

Nabucco Route

The updated project route is as follows[4]:

- Bulgaria: 424 km;
- Romania: 475 km;
- Hungary: 383 km;
- Austria: 47 km (see Figure 1).

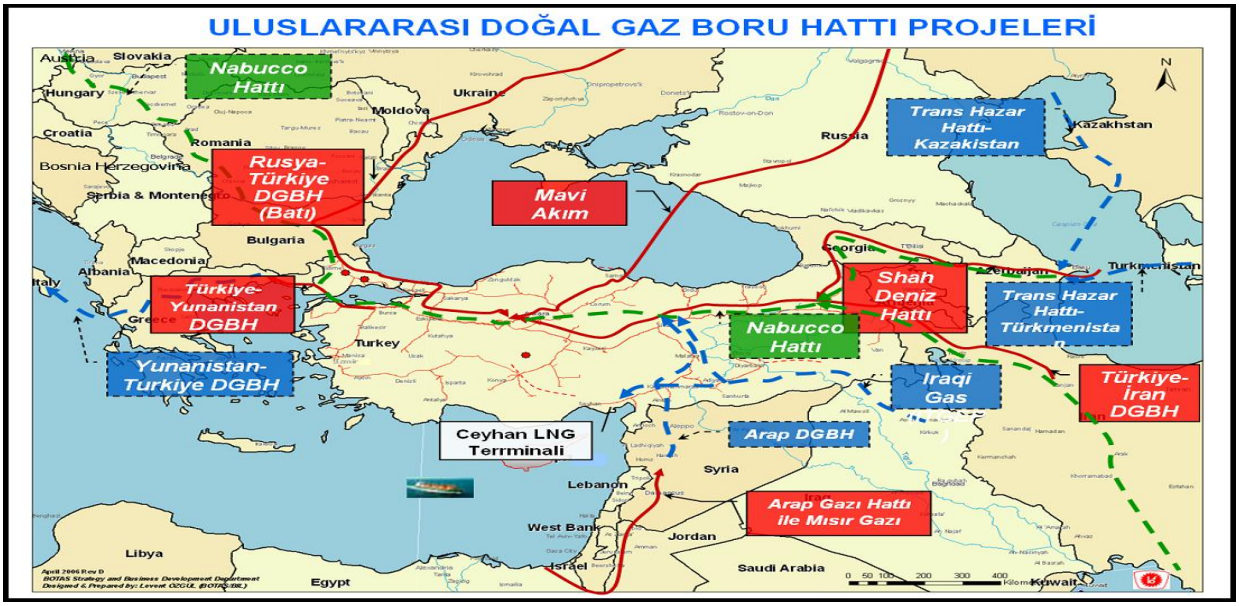

Figure 1. An overview of The TANAP and Nabucco routes.

Discussions on First Gas Flow and Route of TANAP

Azerbaijan SOCAR President Rövnag Abdullayev said that the distribution of first gas over TANAP will

[4] Retrieved from http://tr.wikipedia.org/wiki/Nabucco_Boru_Hatt%C4%B1_Projesi.

be started in the year of 2019.

Rövnag Abdullayev made this aforementioned explanation at the conference held within the framework of "Caspian Oil and Natural Gas 2013" fair which started in capital Baku nowadays. SOCAR President said that the 16 billion cubic meters natural gas to be taken out from Shah Sea basin will be transported at first stage upon activation of the line. Abdullayev added his remarks that the capacity of this line will be increased by supplying from other different explored basins later on.

SOCAR President expressed that the route after Turkey with regard to transportation of Azerbaijan natural gas to Europe will be clear late in the month. Upon activation of the line, Azerbaijan is going to possess an important position in point of energy safety also for Europe after Georgia and Turkey. Abdullayev, who gave information about available natural gas reserve of Azerbaijan, added his remarks that his country will produce 20 billion cubic meters natural gas per year in 2015. Meanwhile after the declaration of TANAP, two rival projects have emerged so as to meet the pipe line route at two European borders. The Nabucco West targets the east and middle Europe natural gas market starting from the Bulgaria border and TAP targets the south Europe natural gas market with a pipe line to be constructed underneath of the Adriatic Sea starting from Greece border.[5]

The Race Among TANAP, Nabucco, and South Stream

Following the finalization of the natural gas extracted from "ShahDeniz" Sea of Azerbaijan would be transported with TAP, to its high cost English BP, Norway's Statoil, and Azeri SOCAR companies' reason—behind the cancellation process of Nabucco project also including Turkey is the high energy prices in Italy and Greece. Nabucco project did not have suppliers. The gas agreement to be signed for repayments has been planned but the agreement could not be signed. Russia finished the Nabucco project by signing South Stream Project with Italy, France, and Germany.

At the first time, Azerbaijan gas will be transported over the west border of Turkey with the TANAP project. It is aimed to ensure a price competition by removing the price monopoly of the Russian (Gazprom) gas which possesses the monopoly in Europe, transported to and used in Europe.

The emergence of TANAP pipe line project has disquieted Russia which possesses the Europe market with South Stream and other projects, and has regarded the project as a rival against the South Stream. From the beginning of the process, Russia, Azerbaijan, and Turkey all have said that projects or countries were not rivals. However, the seriousness of the competition can be understood at this point; Russian Gazprom Natural Gas Distribution Company has joined the privatization tender of Greek natural gas company DEPA, and afterwards Azerbaijan SOCAR Natural Gas Company has joined the privatization tender of DESFA Company which is responsible of internal pipe line of the country. Within this process, the visit of Greece Prime Minister Samaras to Baku, and afterwards the visit of Gazprom CEO to Athens show the competition in the process. Greece's choosing the Shah Sea II (TAP) has made the Nabucco project a thing of the past and Russia has guaranteed the South Stream project by enabling Bulgaria and Greece to remain in the process during the South Stream project.

When the authors look at these two projects, namely, South Stream and TANAP projects on the point of

[5] Retrieved from http://www.21yyte.org/arastirma/enerji-ve-enerji-guvenligi-arastirmalari-merkezi/2013/07/01/7090/sah-deniz-neden-trans-adriyatik-boru-hattini-secti.

Turkey, Turkey wants to maintain oil and natural gas resources which are received from Russia and dependent thereof, at the same time it is seeking for new resources by reducing its dependence. When we consider the whole process, Turkey has signed TANAP, also has continued with South Stream project. In this case, Russia expressed its displeasure to Turkey under any circumstances within TANAP process which is deemed in competition with the South Stream project.

Conclusions

For the first time, Azerbaijan has enabled to transport its own natural gas with TANAP and TAP projects. When we look at the routes of these projects, South Stream and TANAP projects' routes do not coincide. Meanwhile, Turkey should take place in both two projects, namely, South Stream and TANAP projects, at the same time it should continue to buy the energy that is purchased from Russia and should protect its stability without damaging energy policies. It has been stated that the construction of South Stream project will be started at the end of 2012. In the event of the South Stream project's earlier completion and South Europe's filling the gas reserves as to meet, what will the TANAP project will be realized. These questions are required to be answered seriously.

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Chinese Business Review, ISSN 1537-1506
December 2013, Vol. 12, No. 12, 821-833

A Comprehensive Audit of Corporate Social Responsibility

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As enterprises expand globally, the social value of their operations is assessed on the full range of their contribution to society. Enterprises must be profitable to succeed, but they also should strategically align their operations so far as feasible and sustainable in order to address related social needs. This alignment includes not only the beneficial design and quality of goods and services an enterprise produces, but also enhancing the beneficial effects that its full range of business processes, systems, and practices have on society. A comprehensive enterprise corporate social responsibility (CSR) audit is based on two comprehensive social systems models—one of society as a whole and another of the corporate organization. By juxtaposing these two models—which are mirror images of each other—an enterprise can identify various points where its activities intersect with relevant social needs and can configure its operations so far as feasible to alleviate pressing social issues. Using a comparative cost-benefit analysis, the enterprise determines which systems, processes, and activities need to configure or adapt in order to better address the societal needs that are most critical for its success. They may require the enterprise to re-design products or services, develop new activities or desist in others, or reconfigure processes or systems. Thus, enterprises must decide which options are most feasible in light of the societal benefit they are likely to produce. As creatures of society, enterprises have much to gain by strengthening civil society and addressing its most pressing needs whenever possible within the limits of its commercial mission. What action to take depends upon the firm's cost-benefit analysis.

Keywords: corporate social responsibility (CSR), enterprise audit model, social process model, corporate culture, corporate process.

Introduction

Throughout the world, private enterprise plays a dominant role in building societal wealth and in furthering socio-economic development. Disciplined by the economic incentives of an increasingly free and competitive marketplace, private enterprise of every size contributes—directly or indirectly and intentionally or not—three types of societal value:

- Transforming creative ideas into innovative solutions through products and services that sustain life and

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improve the standard of living;

- Mobilizing labor, technology, and capital to build productive wealth for present and future generations;
- In the way it functions and conducts operations, generates "spin-off", "spillover" and collaborative effects (externalities) that benefit society through improvements in knowledge, technologies, methods, and skills, and community improvements.[1]

Highlighting these effects through an enterprise audit of corporate social responsibility (CSR) should enable firms to align their operations more effectively with societal needs and priorities.

The CSR enterprise audit model proceeds from the premise that private enterprise—as a social system and institution—is dependent on societal recognition and the support of social institutions for its success. As a creature of society, it also mirrors many of the dynamics and must come to terms with many issues of society at large (Tönnies, 1887). If public education is weak, for instance, enterprises suffer as well in the quality of their work force. At the same time, private enterprise distinguishes itself from society at large through its private ownership, singleness of purpose, relatively limited resources, profit-oriented necessity, and its dependence on pricing signals from the market place. Within these parameters private enterprise has an enlightened self-interest as well as the moral imperative to align its activities and organizational functions with the general welfare of society (Bowen, 1953). Through an enterprise audit, companies can ascertain what they reasonably can do—within the parameters of their operations and subject to their competitive positions in the market—to address recognizable social needs. However, they must have the will and flexibility to experiment and to align their operations to affect these needs.

Much has been done to identify the various ways in which CSR initiatives may enhance business value, performance, and reputation. In addition to the substantial "business case" for CSR (Holliday, Schmidheiny, & Watts 2002), a 360-degree CSR enterprise audit provides the means for companies to benchmark and enhance their CSR contributions:

- Identifing ways in which an enterprise presently is contributing to the betterment of society. These contributions often go unrecognized and unappreciated in the midst of meeting operational deadlines and in the heat of public policy debates in business activities;
- Identifing opportunities to better align enterprise systems with societal needs, possibly in collaboration with other non-governmental as well as governmental organizations;
- Sensitizing employees to the importance of CSR, and engaging them in the effort to identify opportunities for the enterprise as well as to become individually involved in addressing social needs outside the workplace;
- Identifing ways in which institutions throughout society—in addition to the enterprise itself—could better address social issues and improve the general welfare, whether through collaboration with stakeholders or through regulatory or other changes in laws that would enable or induce private enterprise to better align its operations with the general welfare.

No simple formula, such as the "invisible hand" of free market forces, will enable an enterprise to better align its private business interests with those of the public. In the short to the medium term perspectives of the competitive marketplace, multinational businesses face a highly diverse array of institutions, market

[1] As used here, "spin-off" refers to a by-product of a process, systems, or activity of an enterprise undertaken for other reasons (e.g., hiring locally benefits the local economy through the "multiplier effect"); "spillover" is an uncompensated valued effect of an activity (e.g., hiring locally gives greater stability to family life; and "collaborative effects" are social synergies that result when companies coordinate their operations with societal needs and initiatives, whether governmentally or civically inspired (e.g., firms advising vocational schools: training for skills which are needed to secure jobs in their operations).

characteristics, regulatory requirements and social issues they must understand in order to operate successfully and to optimize the "spin-off value" of their operations for society (Porter & Kramer, 2006). These issues often materialize as market imperfections, the misalignment of property rights, weaknesses and biases in legal systems, public policy and infrastructural limitations, dislocation effects from ongoing changes in economies, weak ethical norms, mistrust of and among commercial and public sector decision-makers, and low societal expectations (World Bank, 2005).

These country environmental shortcomings represent both challenges and opportunities for responsible enterprise initiatives. International business is conducted within and among a variety of imperfect country/societal settings, each of which exhibits distinctive socio-economic needs and challenges such as those just listed. The genius of management should, within the limits of corporate profitability and sound business judgment, configure company operations in ways that constructively complement local conditions, in terms both of the norms of society and of socio-economic development. As will be seen, this imperative does not impose heroic actions on an enterprise, but merely challenges it to adopt an enlightened long-term view of its role in society. This requires each enterprise to carefully assess how it operates and how it could orient its operations to contribute more effectively to socio-economic development. As an added bonus, the audit of operations will reveal ways in which enterprises already are contributing to the welfare of society.

Enterprise Audit Models and Process

The following outlines a four-step sequential process for conducting a CSR 360-degree enterprise audit. It must be undertaken separately for each country of operations, because a firm's operations and its social environment are distinctive for each country.

Step 1: Reviewing the strategic imperatives of the enterprise—its mission/vision, requisite core competencies, and working assumptions.

Step 2: Using the nine major dynamics of the "social process model", map the range of distinctive societal needs for each country where the enterprise has operations.

Step 3: Using the nine major dynamics of the "corporate process model", systematically review all facets of enterprise activities (including systems and processes) in light of the firm's strategic country objectives to determine at which points opportunities exist for aligning these activities to (better) address societal needs.

Step 4: Using a comparative cost-benefit analysis, determine which enterprise activities to configure or better adapt to address societal needs.

Step 1: Review the Strategic Imperatives of the Enterprise—Know Thyself

The first step in preparing for an enterprise audit is to review the firm's mission/vision, strategies, and the core competencies underpinning its operations. This should be done within the context of the firm's industry and business model. An essential component of this review is to specify—with respect to each country where the enterprise does business—the working assumptions that the enterprise is making about the country infrastructure, work force skills, societal support systems, and the business environment. Within this framework, an enterprise can assess which social conditions are most critical for its success, at what points its operations most closely intersect with social needs, and the relative value of trade-offs among alternative CSR opportunities and activities.

Without this clarification, there is danger that an enterprise will stumble into a disjointed array of CSR

activities that are neither the most effective, given the firm's capabilities, nor sustainable over the long term. Enterprises are pressured continually from all sides—governments, activists, stakeholders of all kinds, and the media—to contribute to well-meant causes and social well-being. Another pitfall of CSR is to reserve corporate action for the "squeaky wheel". This turns CSR into a public relations gambit that cedes CSR decisions to activist stakeholders and other petitioners. Unhinged from enterprise strategy, CSR falls prey to budget cuts, shifts among executive agendas, and the next great idea.

Enterprise strategy clearly defined, therefore, is essential for selecting sustainable and effective CSR initiatives at the country level. Focusing CSR through the lens of firm strategy also enables the enterprise to:

- Staying in touch with trends affecting the enterprise and the firm's social impact society;
- Encouraging employees to recognize, appreciate, and possibly engage in arenas of society that affect the enterprise, including identifying likely partners to work with;
- Anticipating societal needs and formulate ideas for new products and services;
- Enabling the effective coordination and integration of CSR activities as a whole;
- Providing a clear rationale and objective criteria for assessing and costing-out competing CSR demands and opportunities;
- Ensuring the sustainability of corporate interest in CSR activities.

The next steps involve complementary models of society (Step 2) and the corporate enterprise (Step 3), which enable firms to undertake a comprehensive CSR audit.

Step 2: Map the Range of Distinctive Social Needs for Each Country of Operations—By Referencing the Nine Dynamics of the "Social Process" Model

The task of acquainting a firm with the societal needs of any country is vast. It is narrowed through the strategic review discussed in Step 1 and through the discipline of the "social process" model that follows. This enables the enterprise to focus on those social conditions that are most critical for its success, whether they relate to greenhouse gas emissions, health care, or some other concern.

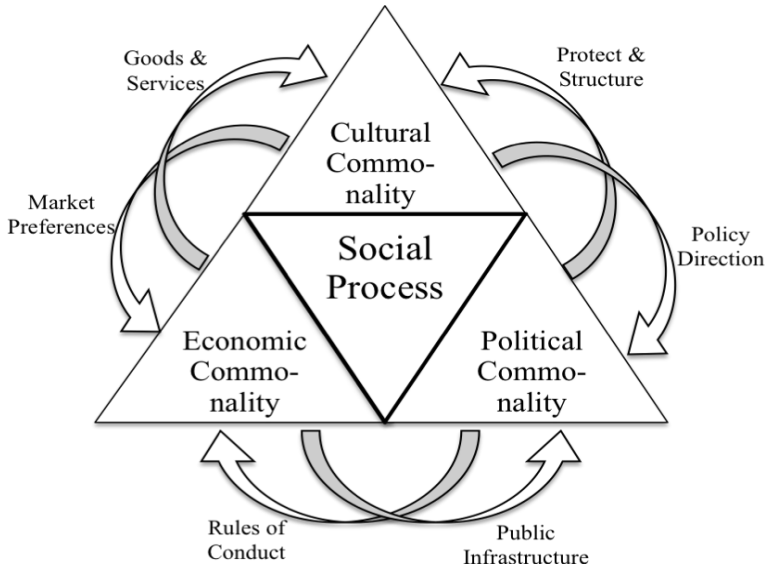

Figure 1. Complementary social realms.

Social process model. The social process triangle (SPT) model, described in Figure 1, provides a frame of

reference for identifying societal needs and for tracking changes in the social environment. Its triangular multi-level framework—interrelating economic, political, and cultural dimensions—is designed to encompass the essential dynamics of any society. As such, it provides a comprehensive template for reviewing social conditions, assessing how they interrelate and affect each other, and identifying related institutions (Mann, 2006).[2] SPT presents society as three major interdependent realms—economic, political, and cultural. Each realm consists of social dynamics or variables, which reference social functions present in some form in every society (Bell, 1976). This tripartite model is intended to encompass every facet of society, recognizing that the manifestations of these dynamics will vary by society, the way they interrelate and their institutional characteristics. The model provides the framework for a systematic review of society.

The triangular design of the model reflects the inter-relatedness of social dynamics. Thus, economic commonality characterizes the life-sustaining (foundational) activities of every society in the form of goods and services and of the infrastructure. Political commonality, by contrast, encompasses the dynamics of governance and public institutions. These dynamics produce rules and decisions that guide and regulate how individuals and organizations produce and distribute wealth, whether in a market-based or command economy. They generate rules and institutions that protect and promote the (cultural) values, practices, and behaviors essential to society, e.g., marriage, family, religious worship, education, etc.. Of utmost importance, the cultural commonality provides direction to the other two realms. Its dynamics freight the values that shape daily patterns of interaction and society's identity and mindset (Bell, 1976, p. 36). In market economies, cultural values guide the production of goods and services; in a democracy, they become embodied in laws and social policies.

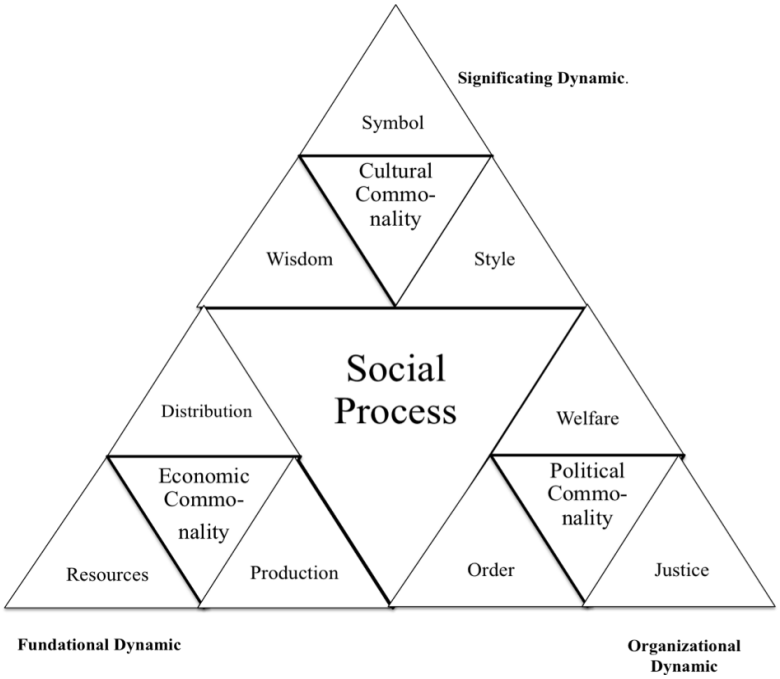

Figure 2. Multi-level social process triangle: Nine essential dynamics.

[2] The social process triangle (SPT) was conceived during the 1970s as part of the grass-roots community development work of the Institute of Cultural Affairs, a multi-cultural non-governmental organization (NGO) that undertook community development projects in every time zone across the world, including India, Indonesia, and Kenya. As summarized here, the model contains some modifications in nomenclature by the author.

Moreover, each of the three realms of the social process triangle is characterized by its own subset of social dynamics (see Figure 2). The rationale used in defining the three major realms (i.e., foundational, organizational, and significant perspectives) guides their sub-division into three interactive dynamics. These three sets of fractals define the nine-dimensional multi-level triangle. Thus, the economic realm consists of a generic value chain of resources, production, and distribution; the political realm is concerned with a system of orderly rule, administering justice and ensuring the welfare of the citizenry; and the cultural realm defines how societal wisdom is nurtured, the style of how people interact, and the sacred values symbols of societal identity.

Nine societal reference points. For purposes of this paper, these nine individual dynamics provide a comprehensive set of reference points for assessing social issues of potential concern to an enterprise. Figure 3 provides an overview of how the dynamics relate to various functions of society. While these functions embody discrete social dynamics, a moment of reflection will demonstrate that they are intimately interrelated with each other and provide a comprehensive map of social dynamics and a checklist for surveying societal needs.

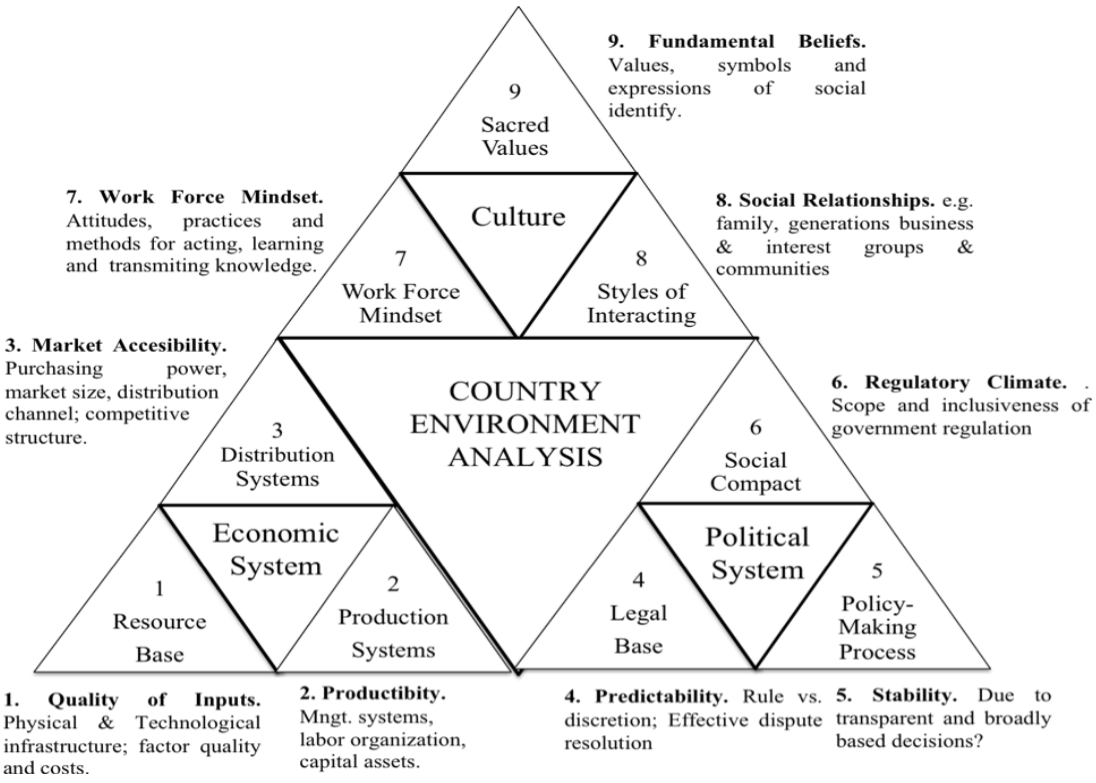

Figure 3. Nine societal benchmarks.

Survey of societal needs. The nine social process dynamics provide a checklist for surveying existing societal needs and for mapping where they are likely to intersect with enterprise activities. This assessment is sharpened by reference to the enterprise's working assumptions about its operating environment.

Step 3: Systematically Review All Facets of Enterprise Activities to Determine How to Better Align Them With Societal Needs

The third step in an enterprise audit is to examine the processes and activities of the enterprise itself. The first imperative of any enterprise, as an integral part of society, is to "do no harm". So, any business activity that may pollute, create hazardous conditions, or produce defective products, for instance, must be avoided and

any damage quickly rectified in keeping with good industry practice and state-of-the-art technology. As industry practice and technology are continually evolving, companies should be expected to use "best efforts" to monitor and improve their products and services and the effects of their operations.

The "corporate process" model: A mirror image of society. A corporate audit, employing the corporate process triangle (CPT), may uncover opportunities to better align a company's activities with the needs of society. It also provides the enterprise with a baseline for judging the effectiveness of its present contributions to society. As previously discussed, CPT premises the enterprise as a mirror image of society, its social dynamics, and its social issues. In many respects, organizations are society "writ small" (see Figure 4) like society, organizations function as "open systems", whose parts interact with—and are shaped by—the larger environment. Further, as systems, organizations are defined—and their effectiveness largely determined—by the way in which their parts relate to each other.

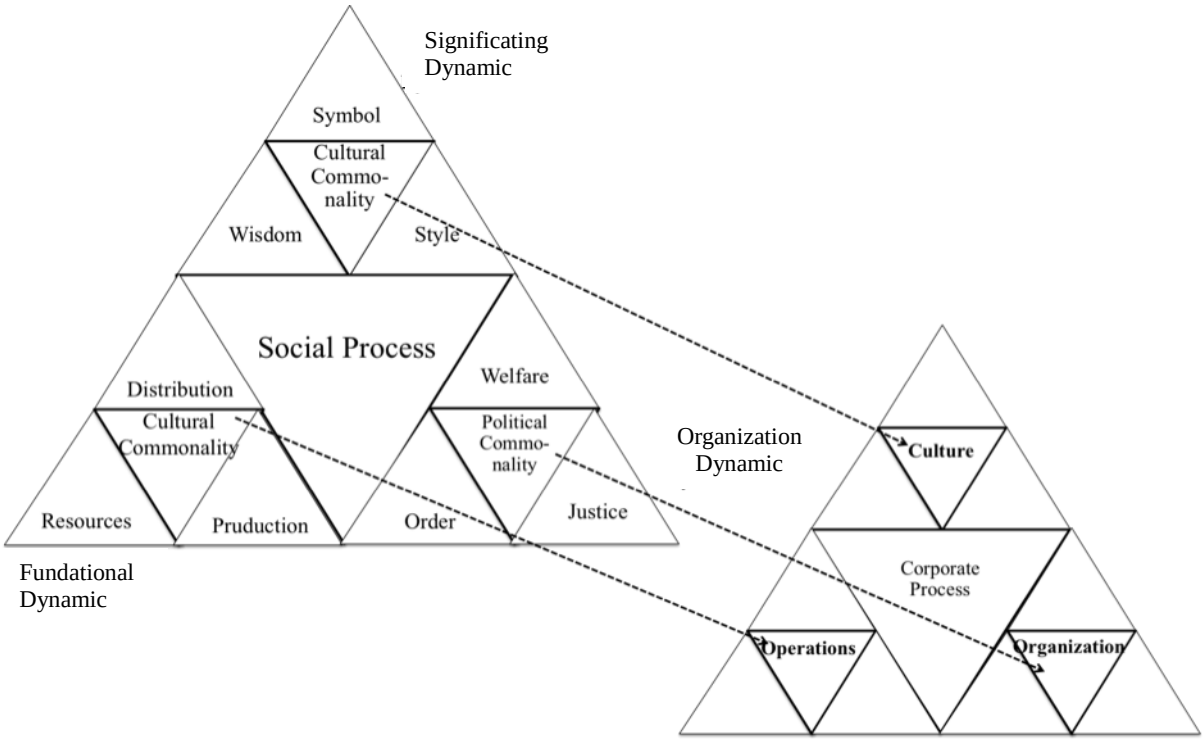

Figure 4. Organizations as mirror images of society.

As a framework for delineating organizational systems, CPT (see Figure 5) consists of three major dynamics—corporate operations, corporate organization, and corporate culture. These correspond to the three major dynamics of the social process triangle. CPT also follows the same rationale at all levels: The lower left triangle in each realm reflects the foundational dynamic, the lower right triangle the organizational or decisional dynamic, and the upper triangle the significating dynamic.

Despite the similarity between social and corporate dynamics, the enterprise system has its own nomenclature, as follows:

Corporate operations form the heart of a firm, i.e., its productive capability, whether these are goods or services. This dynamic is "foundational" for the process as a whole, because without it the firm has no output nor justification for attracting resources. The three sub-dynamics—resources (foundational), production

(organizational), and marketing (significating)—may be viewed as parts of a value chain as depicted by Porter (1985). From a system perspective, however, it would be more apt to think of these sub-dynamics as a value network. The term "network" suggests that these parts be viewed not just linearly (as a chain) but interactively as a system.

Corporate organization, by contrast, largely covers the dynamics traditionally referred to as management. All three dynamics (and their functions): administration (foundational), decision-making (organizational), and mission (significating). The latter dynamic serves the same role as its "welfare" counterpart in the social process triangle, i.e., reflecting the firm's compact with its employees and other constituencies.

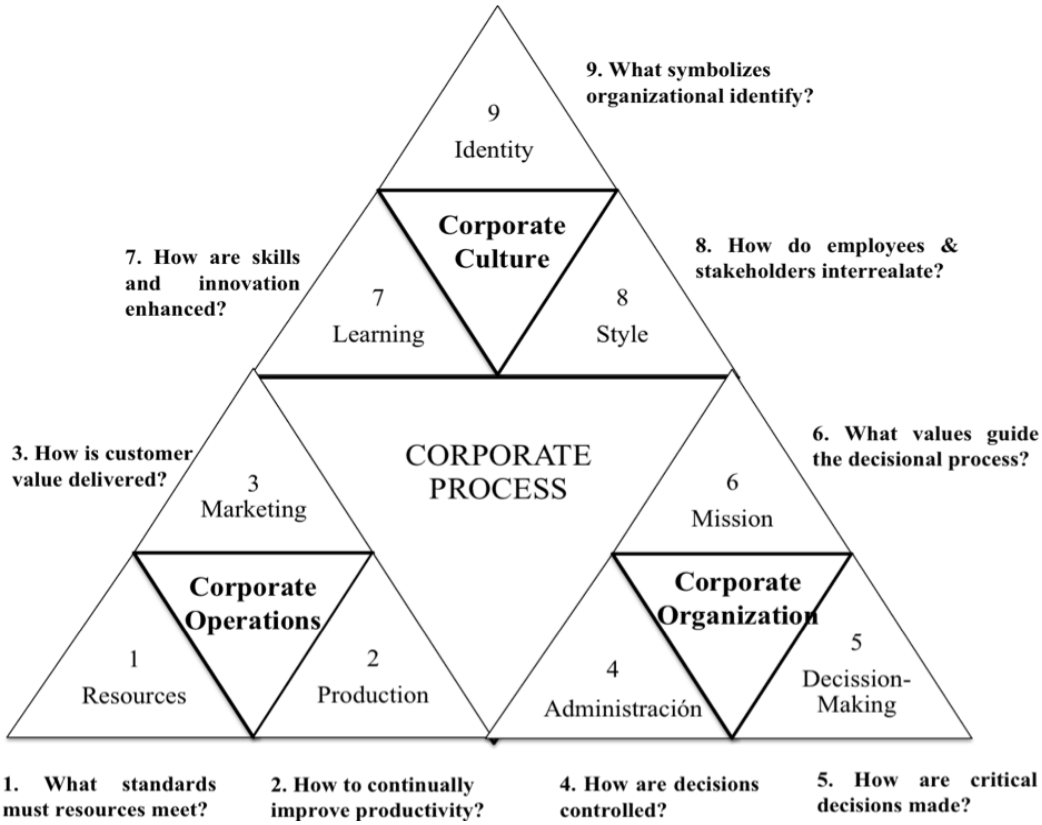

Figure 5. Corporate process dynamics.

Corporate culture plays very much the same role for organizations as it does for societies. It provides organizations with identity and embraces the dynamics that act it out. Compared to the corporate operations and organization dynamics, however, the culture of transnational companies is perhaps most directly affected by country and region-specific differences. Thus, the work ethic and the way people think and learn (learning) directly impacts on the firm's productivity. Further, the way people relate to each other in their business lives, and the way they make decisions and honor each other (style) determines in many cases the viability of negotiations, business transactions, and international partnering.

Finally, identity refers to the process of creating employee and organizational self-consciousness, both internally and externally, about the guiding values, purposes, and symbols of firms. Despite employee diversity, multinational enterprises have a significant capacity to generate a culture that takes CSR seriously (Götz & Bleher, 2006).

CPT provides a framework for mapping a firm's business processes, systems, and practices. This map enables a firm to identify those points of intersection where its activities and the conduct of its business may be configured to contribute more effectively to addressing social needs. Changing the way a firm functions, of course, typically requires creative thinking and experimentation in order to ensure that changes in systems and practices are doable, economically viable, strategically sensible, and—as a result—sustainable by the enterprise.

Auditing enterprise activities. In conducting the third step of an enterprise CSR audit, the first task is to determine where and how the firm's activities intersect with society. The nine CPT dynamics provide a comprehensive map both to identify points of intersection and, then, for discerning how its systems and processes could be re-configured to better address the array of social needs it detected in its SPT country analysis.

This step entails interactively vetting the two models to determine what changes the enterprise could most usefully make in the way it conducts business. It can be undertaken through workshops involving a representative group of employees drawn from the various departments of the enterprise, which as a group are knowledgeable about all nine dynamics and are sensitive to social issues. Both sides of the CSR ledger should be considered, i.e., present and potential benefits for society and the enterprise.

The following outline is intended simply to illustrate how CPT can be used to map an enterprise CSR audit. A firm's activities must always be customized to some extent to each society. They should be tailored, where possible, to have mutual benefits for enterprise and society.

Corporate operations. Corporate operations refers to the in-sourcing, production, and marketing systems used by enterprises to transform inputs into goods and services and deliver them to customers. It encompasses what is generally referred to as the enterprise "value chain", which can vary significantly by industry and firm. It consists of three dynamics:

(1) Resources dynamic refers to the process of sourcing or developing the primary factors of production needed to produce a firm's output, both goods and services. Examples include:

- Establishing standards for quality of inputs, which challenge suppliers to improve their skills and those of their suppliers;.
- Assisting new and emerging suppliers to improve their production and management techniques, e.g., Sears, Roebuck & Co.'s mass merchandising operations in Latin America 1950-1970;
- Establishing standards for production processes, e.g., for labor and wages and benefits, reprocessing of faulty parts, and non-polluting production methods.

(2) Production dynamic refers to the process of refining and transforming resources into capital and consumer goods and services. It encompasses both the hardware (i.e., equipment) and software (i.e., management systems and techniques) of the production process, and the mobilization of personnel to accomplish the various tasks. Examples include:

- Lowering waste of materials and utilities (water, energy) used in production and other corporate activities, e.g., educate employees how to reduce waste, whether on the shop floor or in the company cafeteria;
- Establishing competition among employees for eliminating polluting activities of any kind in the production process;
- Working closely with technical schools and business schools to enhance mutual learning and teaching about best practices.

(3) Marketing dynamic refers to the process of defining, anticipating, creating, and fulfilling customers'

wants and needs for products and services. As the final stage in the value chain, it encompasses all aspects of ensuring that customers experience added-value in the acquisition and use of products and services. Examples include:

- Remaining closely in touch with consumers and their behavior in order to design and monitor the effects of products (product stewardship), so as to ensure they have maximum health and safety features, are energy-efficient, minimize pollution potential (e.g., McDonald's use of bio-degradable wrappers), can be readily repaired (rather than simply discarded at the first breakdown), etc.;
- Designing products that can be purchased in smaller lots for those on lower budgets. This may involve alternate business models (Prahalad, 2005);
- Promoting honesty in advertising, and provide content on packaging that guides intelligent consumer choice.

Corporate organization. Corporate organization refers to dynamics by which an enterprise designs, structures, governs, and administers its operations and functions and makes decisions about its future. It encompasses most aspects of traditional management functions (e.g., planning, organizing, motivating, staffing, and controlling), although these are in part shared with the operations and culture dimensions of the enterprise. It consists of three dynamics:

(1) Administration dynamic refers to the processes of monitoring, supervising, and disciplining the day-to-day operations of the enterprise throughout the range of its value chain with respect to inputs/outputs, budgets and financing, and corporate policy. It ensures that enterprise operations remain within the parameters of work-stated goals. Examples include:

- Establishing within the enterprise standards for bidding and the regular auditing of transactions to avoid the temptation to engage in corrupt practices;
- Further transparency within industries by working through industry associations to establish clear common industry standards for accounting and reporting to the public;
- Adopting generally accepted standards for environmental management (ISO 14001). Squeeze-out puffery from CSR reporting.

(2) Decision making dynamic refers to the process by which firms set their long-term directions, allocate corporate resources and balance the interests of major corporate constituencies. This dynamic will vary widely among firms, depending on whether they are closely or publicly-held companies and on their organizational configuration, e.g., entrepreneurial, machine or professional bureaucracy, divisional, "adhocracy", etc.. Examples include:

- Establishing measurable CSR outcomes for all facets of the enterprise that are integrated with corporate strategy;
- Establishing and nurture collaborative relationships within the industry and with non-governmental organizations to ensure environmental standards, e.g., Forest Stewardship Council for lumber producers and distributors;
- Working with business schools to ensure mutual learning and teaching about best management practices.

(3) Mission dynamic refers to the process of defining the business purpose and how the importance of involving and obtaining commitment from the full range of stakeholders. This process often entails trade-offs, for enterprise resources are limited compared to the aspirations of constituencies. Examples include:

- Developing health plans with local health care providers that meet the needs and salaries of employees;

- Hiring locally, where possible, to strengthen community ties and support local communities economically;
- Encouraging and following generally accepted labor standards (e.g., SA 8000),[3] responsible fishing (Marine Stewardship Council), and lumbering (Forest Stewardship Council) practices.

Corporate culture. Corporate culture refers to all aspects of the corporate process, which engenders values, fosters creativity, and generates meaning within the enterprise. It encompasses a common enterprise language, values, and philosophy, a sense of vocation and commitment to enterprise operations, and ways of working and interacting with stakeholders and the public at large that build and reflect the enterprise's reputation. It consists of three dynamics:

(4) Learning dynamic refers to the process of individual and organizational learning and of transmitting and perpetuating the firm's philosophy (Weltbild) or understanding of "what makes sense". What is being learned and practiced is not simply applied skills, but methods of learning, thinking, operating, and interacting with the environment that are considered necessary to the firm's continued effectiveness. These are, to a certain extent, distinctive for each firm. Examples include:

- Establishing regular training schedules for all employees to ensure they are using their potential and increasing their skill level;
- Establishing a program for recruiting some jobs from among less fortunate but able persons;
- Challenging employees at every level to be innovative about the way they work in order to improve products and services, the firm's value to society and the environment, and creative thinking in others.

(5) Style dynamic refers to the process by which firms act out their working relationships, i.e., structuring work activities, making decisions, recognizing exemplary contributions, and conducting business with others. This is imbedded in every aspect of corporate life, being more action than words. Examples include:

- Establishing a strict code of conduct and actively educate employees on how they should conduct themselves honestly in all business dealing.
- Building trust among stakeholders and within local communities where the enterprise conducts operations, including respect for the local customs, values, and the living environment.
- Honoring both the letter and spirit of agreements in ways that promote mutual success of working relationships.

(6) Identity dynamic refers to the process of creating employee and organizational self-consciousness about the guiding values and social philosophy of the enterprise. These values and purposes may or may not be well articulated, and may be submerged under a barrage of advertising and public relations rhetoric. After the rhetoric is stripped away, these values and philosophy should be clearly articulated in the mission of the firm and exemplified in its working culture and relationships with others. Corporate identity generates both commitment among employees and projects an enterprise image that can be valuable for attracting new talent. Examples include:

- Instilling pride of workmanship and encourage employees to work to high standards;
- Encouraging employee involvement in local community services and activities;
- Collaborating with community organizations by investing in local community services, e.g., Starbuck's investment in housing, health clinics, and schools in coffee-growing communities (Starbuck's, 2006).

[3] SA8000 is a social accountability standard based on the UN Universal Declaration of Human Rights, Convention on the Rights of the Child and various International Labour Organization (ILO) conventions.

Step 4: Using a Comparative Cost-Benefit Analysis, Determine Which Enterprise Activities to Configure or Adapt to Better Address Societal Needs

Step 4 is the final step in the enterprise audit. Using a comparative cost-benefit analysis, the enterprise determines which systems, processes, and activities identified in Step 3 to configure or adapt in order to better address societal needs identified in Step 2. As noted earlier, many of these modifications may have a direct effect on addressing societal needs, e.g., through the design of its products, services, or production processes, while others may be more indirect through "spin-offs" and "spillover effects". They may require the enterprise to re-design products or services, develop new activities or desist in others, or reconfigure processes or systems, i.e., change the way the enterprise does business. The list could be substantial.

Enterprises must decide which options are most feasible in light of the societal benefit they are likely to produce. Some options may increase revenue or reduce costs, while others may do neither. Enterprises should be motivated to make changes where the economic effects on the firm are positive or at least neutral, and should be counseled to do so where the costs to society outweigh benefits to the firm. Moreover, an audit may reveal a mutuality of benefits: The many ways in which the enterprise already benefits society and how society benefits the enterprise. An audit may also disclose opportunities for enhancing social benefits by collaborating with private voluntary organizations and by reinforcing or complementing government initiatives. As creatures of society, enterprises have much to gain by strengthening civil society and addressing its most pressing needs whenever possible within the limits of its commercial mission.

Conclusions

This CSR audit approach seeks to underscore the fairly obvious point that business enterprise, as a social institution, is an important vehicle of socio-economic development. Its creativity provides valuable social services and can fill niche needs that government cannot readily address. The widely diverse missions of business are a great strength for the economy and for CSR, because highly diverse perspectives will be brought to bear on societal needs, serving both commercial and social needs.

The social and the corporate process models are tools for enterprise self-examination. They provide a vehicle for mapping where the operations of an enterprise intersect and how they potentially affect society. These effects are typically beneficial but may have some adverse aspects. The CSR audit is intended to identify both aspects, so that the enterprise can take appropriate action. Examining the enterprise as a social system provides perspective for evaluating how organizational activities interact with each other and their impact on other "social" systems. In this way, enterprises can uncover new options. What action to take, of course, depends upon the firm's cost-benefit analysis.

Another insight that emerges from a 360-degrees enterprise audit is the realization that many actions with CSR value also strengthen the firm's competitive advantage. To a large extent, this depends on CSR activities being strategically focused. Being aligned with the firm's strategy helps ensure their long-term sustainability. Activities without a strategic rationale—whether classified as CSR or not—are likely to enjoy only a short life span as enterprise personnel change and competition intensifies.

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Chinese Business Review, ISSN 1537-1506
December 2013, Vol. 12, No. 12, 834-845

A New Approach for Knowledge Discovery in Distributed Databases Using Fragmented Data Storage Model*

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Since the early 1990, significant progress in database technology has provided new platform for emerging new dimensions of data engineering. New models were introduced to utilize the data sets stored in the new generations of databases. These models have a deep impact on evolving decision-support systems. But they suffer a variety of practical problems while accessing real-world data sources. Specifically a type of data storage model based on data distribution theory has been increasingly used in recent years by large-scale enterprises, while it is not compatible with existing decision-support models. This data storage model stores the data in different geographical sites where they are more regularly accessed. This leads to considerably less inter-site data transfer that can reduce data security issues in some circumstances and also significantly improve data manipulation transactions speed. The aim of this paper is to propose a new approach for supporting proactive decision-making that utilizes a workable data source management methodology. The new model can effectively organize and use complex data sources, even when they are distributed in different sites in a fragmented form. At the same time, the new model provides a very high level of intellectual management decision-support by intelligent use of the data collections through utilizing new smart methods in synthesizing useful knowledge. The results of an empirical study to evaluate the model are provided.

Keywords: data mining, decision-support system, distributed databases, knowledge discovery in database (KDD)

Introduction

Large enterprises usually encounter enormous electronic transactions upon distributed infrastructures. They use huge database management systems (DBMS) to store and utilize these transaction. The stockpiled data collections in these systems are the best source for providing necessary material for decision-making process to support managers and executives. The existing models for supporting decision-making such as Fayad Knowledge Discovery in Database (KDD), Sample, Explore, Modify, Model, and Assess (SEMMA), and Cross Industry Standard Process for Data Mining (CRISP-DM) encounter practical problems while facing many types of real-world data sources, including the data collections in distributed databases. The distributed

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databases usually store fragmented data in large scales. This fragmentation makes the distributed database more efficient by keeping the tuples at the sites where they are used the most to minimize data transfer. Therefore the end-users can practice a much faster transaction speed. This fragmentation also provides more data security by minimizing inter-site traffic. Unfortunately this kind of data storage causes practical problems for the existing decision-support models. The problem is more severe in heterogeneous distributed databases.

Distributed databases might be heterogeneous or homogeneous. In a heterogeneous distributed database, different sites may use different schemas, and different database management system software with different format of data storage. In a homogenous distributed relational database they use the same DBMS nevertheless still they split the conceptual relations to vertical and/or horizontal fragments. These fragments are usually stored in different geographical sites where they are more regularly accessed. Vertical fragmentation can be defined as a projection on the relation *R*. Each projected subset must include the primary key so the original relation can be reconstructed by taking the natural join of all fragments: $R = R_1 \bowtie R_2 \bowtie \bullet \bullet \bullet \bowtie R_n$. while $\bowtie$ represents natural join operator in relational algebra. A horizontal fragment can be defined as a selection on the relation *R*. Each tuple of relation must belong to at least one of the fragments, so that the original relation can be reconstructed by taking the union of all fragments: $R = R_1 \cup R_2 \cup \ldots \cup R_n$, while $\cup$ represents union operator in relational algebra. This paper aims to introduce a new approach that uses a novel strategy for data engineering and supporting management decision-making process. The paper shows how the new strategy not only can tackle the mentioned problem, but also can be significantly effective in increasing the competitive advantage of any kind of organization by intelligent use of available data. This model basically tries to synthesize useful knowledge from collections of organized data.

Literature Review and Background

Decision-support systems have evolved from two main areas of research. The theoretical studies of organizational decision-making (Simon, Cyert, March, and others) conducted at the Carnegie Institute of Technology during the late 1950s and early 1960s and the technical work (Gerrity, Ness, and others) carried out at Massachusetts Institute of Technology (MIT) in the 1960s (Shim, Warkentin, Courtney, Power, Sharda, & Cjroster, 2002). Since the early 1990, substantial advancements in database management systems have provided excellent platforms for emerging new dimensions of data engineering. Regarding the importance of the decision-support systems, academics and practitioners started to design new models for supporting decision-making using database intelligence and data mining techniques. A pioneer in this area is Fayyad who clearly defined a model for KDD process (Fayyad, Piatetsky-Shapiro, & Smyth, 1996). KDD as defined by who is the practice of using data mining methods to extract what is considered as knowledge according to the specification of measures and procedures. The KDD process is preceded by the development of an understanding of the application domain, the relevant prior knowledge, and the goals of the end-user. His work successfully followed by researchers from SAS institute Inc. by introducing SEMMA. These phrases refer to the process phases required to conduct a data mining project. The problem with SEMMA is that it is configured to help the users of the SAS Enterprise Miner software. Another framework, CRISP-DM, initially was conceived in 1996. It is a non-proprietary, documented, and freely available data mining model. CRISP-DM organizes the data mining process into six phases: business understanding, data understanding, data preparation, modeling, evaluation, and deployment (Shearer, 2000), while generally, the sequence of the phases is not strict. A comparative study by Azevedo and Santos (2008) comparing KDD, SEMMA, and CRISP-DM, illustrates

that SEMMA and CRISP-DM can be viewed as implementations of the KDD framework. According to this study, five stages of the SEMMA process can be seen as a practical implementation of the five stages of the KDD process. Another useful analytical framework is the one developed by Chung-Shing (2001). He introduced the framework primarily for evaluating ecommerce business models and strategies, though it is applicable in a wider range.

In all the previous models, practical problems occur when facing real-world data sources. The problem is serious when the data source is stored in a distributed database. The new introduced model provides a solid strategy to solve the mentioned problem. It also can be significantly effective in increasing the competitive advantage of any kind of organization by intelligent use of available data. Therefore it can be used even in the situations that there is not any problem while facing the data sources. The new introduced model is developed in two versions. Multidimensional Mining Management Model (4M) is the name of first version of the artifact that can be used to create a very competent decision-support system. The model emphasizes on using multidimensional data model to provide an interactive investigative and exploratory business perception. Multidimensional Multilayer Mining Management Model (5M) is the name of the advanced version of the artifact. The latter version is more effective than 4M and other existing models because it provides organizational insight. While 4M can solve the problem with distributed data and is featured by its multidimensionality, 5M is multidimensional and multilayer. It is multidimensional because the same as 4M, it focuses on multidimensional data model concepts. It is also multilayer because it uses multilayer mining structure based on the Multilayer Mining Theory (Pesaran Behbahani, Khaddaj, & Choudhury, 2012). These mining structures provide the platform for multilayer mining algorithms to maintain proactivity for the model, rather than just adjusting to situations and waiting for problems to happen. The paper primarily presents the outline of the new model. The results of some empirical study have shown the usefulness of the theory. The model can provide the desired organizational insight thanks to its multilevel mining structures (Pesaran Behbahani, 2012). Though 5M is introduced the focus in this paper is limited to the main features of 4M. The paper also presents the results of evaluating the model by adapting it to the ebusiness discipline. This adaptation results in introducing new software which is called EBAF.

Outline of the New Introduced Model

5M is a model based on multidimensional data and multilayer mining structures designed to intelligently use available data collections in the organizational databases. This intelligent use of data makes the model a significant progress over the existing ones in many aspects. The final outline of the model mirrors the final results of a thoroughgoing empirical study. Though originally designed for distributed databases, 5M serves as a generic model for all organizations wishing to capture database intelligence to significantly enhance their administrative behavior and gain profitable performance. It encourages best practices and offers organizations the structure needed to realize better, faster results from database intelligence. An overview of the model is shown in Figure 1.

Requirement Analysis and Enhancement Plan

In order to understand which data should later be analyzed, and how, it is vital to initially understand the business structure and objectives for which they are finding a solution. The organization understanding phase starts with an initial assessing the situation of the organization and proceeds with identifying its main target.

The most challenging part starts here by trying decomposition of the main target down into measurable objectives. The phase proceeds with identifying main influencers on the objectives, translating the objectives into technical requirements, and activities in order to get familiar with organization resources. Organization understanding perhaps is the most important stage of the model.

Figure 1. A summary of the new introduced model approach (4M).

Centralized Data Warehouse Development

The next phase of model tries to tackle the problem of organizing the collections of data. These collections may be dispersed or distributed in very different ways and the relations can be vertically and horizontally fragmented. These fragments are usually stored in different geographical sites where they are more regularly accessed. Even in a centralized database this data also may be in different and not appropriate formats. This phase consists of identifying required data, collecting initial data, describing data, exploring data, verifying data quality, designing data mart initial structure, identifying control flow tasks, identifying data flow tasks, cleaning data, reconstructing data, reformatting data, and carrying out aggregation calculations on data (see Figure 1). In the final step, the process would be evaluated and reviewed and then data can be populated to data marts and a related report can be produced.

Analysis Engine Development

The data marts that are developed in previous stage only can store leaf-level values, i.e., the measure values that are in intersection of all of the dimensions of a data mart. To solve the problem, some or all of the

possible data aggregates should be calculated ahead of time and stored within the multidimensional data structures. These multidimensional data structures are the best platform for building multilayer mining structures and applying proactive multilayer mining models. There are some distinct key steps in this phase that are summarized in Figure 1. The figure shows that after defining data sources, measures and measure groups, dimensions and dimension hierarchies, Key Performance Indicators (KPI), partitions, mining structures are designed. Then some model validation tests run to validate the models against the measures of accuracy, reliability, and usefulness. The last steps in this phase include evaluating and reviewing the analysis process, deploying the cube design to analysis server, and then processing the multidimensional structure in the analysis server. The final step is producing an analysis engine development report.

Knowledge Delivery Platform Development

Knowledge delivery platform stage in 5M primarily is about choosing the end-users who are in charge of decision-making and designing appropriate reports for them. Knowledge delivery platform can contain a number of report projects, and each report project in turn can contain a number of reports. A report actually is a piece of art meant to convoy a message. This message changes based on the data that drives it. Each report internally contains two distinct sets of instructions that determine what the report will contain. The first set of instructions is data definition. Data definition controls where the data for the report comes from and what information is to be selected from that data. Data definition instruction set contains two distinct parts: the data source and the dataset. The data source instruction set is needed by the report to gain access to a data source that provides data for the report. When the report is compiled, it uses the data source instructions to gain access to the data source. It then extracts information from the data source into a new format that can be used by the report. This new format is called a dataset. The second set of instructions is about the report layout. This instruction set specifies that which field of data goes into which location in the paper layout. There are some basic steps in knowledge delivery platform development phase that are summarized in Figure 1. Identification of the end-users, identification the purpose of each report, planning the authentication and authorization strategy, defining report data sources and data sets, choosing the data visualization methods, configuring reports layout, previewing and assessing the reports are main steps of this phase. It is also very important to have a plan for report maintenance. This stage includes identifying day-to-day activities that need constant monitoring and developing an efficient monitoring. A report of the process is produced at the end, including the list of components like data sources and dataset queries that can be reused.

Research Methods, Validation, and Evaluation

This section validates 5M by adapting it to a real application as a case study and assessing the results in an empirical study. To validate the results, the model has been implemented and applied to ebusiness discipline and the results are evaluated. Choosing ebusiness to apply the generic model is done based on figures that showed a fast growing rate in the ebusiness branches specially in ecommerce domain. Ecommerce originally was identified as the facilitation of electronic commercial transactions, but in recent years, data mining, data warehousing and data integration modeling techniques (Giordano, 2011), and Business Intelligence (BI) have become parts of its body. The term BI has been defined in different ways and in various contexts. Langit (2009) defined it as effective storage and presentation of key enterprise data so that authorized users can quickly and easily access and interpret it. B. Knight, D. Knight, Jorgensen, LeBlanc, & Davis (2010) considered it as a term

that encompasses the process of getting data out of the disparate systems and into a unified model, so it can be used to analyze, report, and mine the data. The approach in this adaptation is more business-driven, rather than current software-driven ones (Fernandez, 2011). Actually traditional views of business activities, like that of Kotler and Kelly (2006) have mainly focused on the physical and human aspects of the organization. The information view of them started getting conceptualized with contributions from Holland and Naude (2004), Jayachandran, Sharma, Kaufan, and Raman (2005) and Kumar Kar, Kumar Pani, and Kumar De (2010) by emphasizing on marketing activities. The instance implementation of the new model is carried out for verification purposes by using Microsoft Visual Studio 2010 and SQL Server 2008. EBAF serves as a best practice blueprint for all kind of enterprises wishing to capture business intelligence and enhance their CRM. This all will be done through creating an architecture that not only provides useful information, but also provides organizational insight. A simplified overview of EBAF is provided by Figure 2.

In Figure 2, a five-stage conversion model including awareness, contact, engagement, conversion, and retention phases is proposed to help identify mid-level mining structures in business domain. The left side of the figure shows how EBAF classifies the people to six main state groups, target audience, aware target audience, unique visitors, active unique visitors, actors, and finally the clients. The right side summarizes the influencers that affect awareness, contact, engagement, conversion, and retention efficiency factors (Pesaran Behbahani, Khaddaj, & Choudhury, 2011). These influencers shape multilayer mining structures.

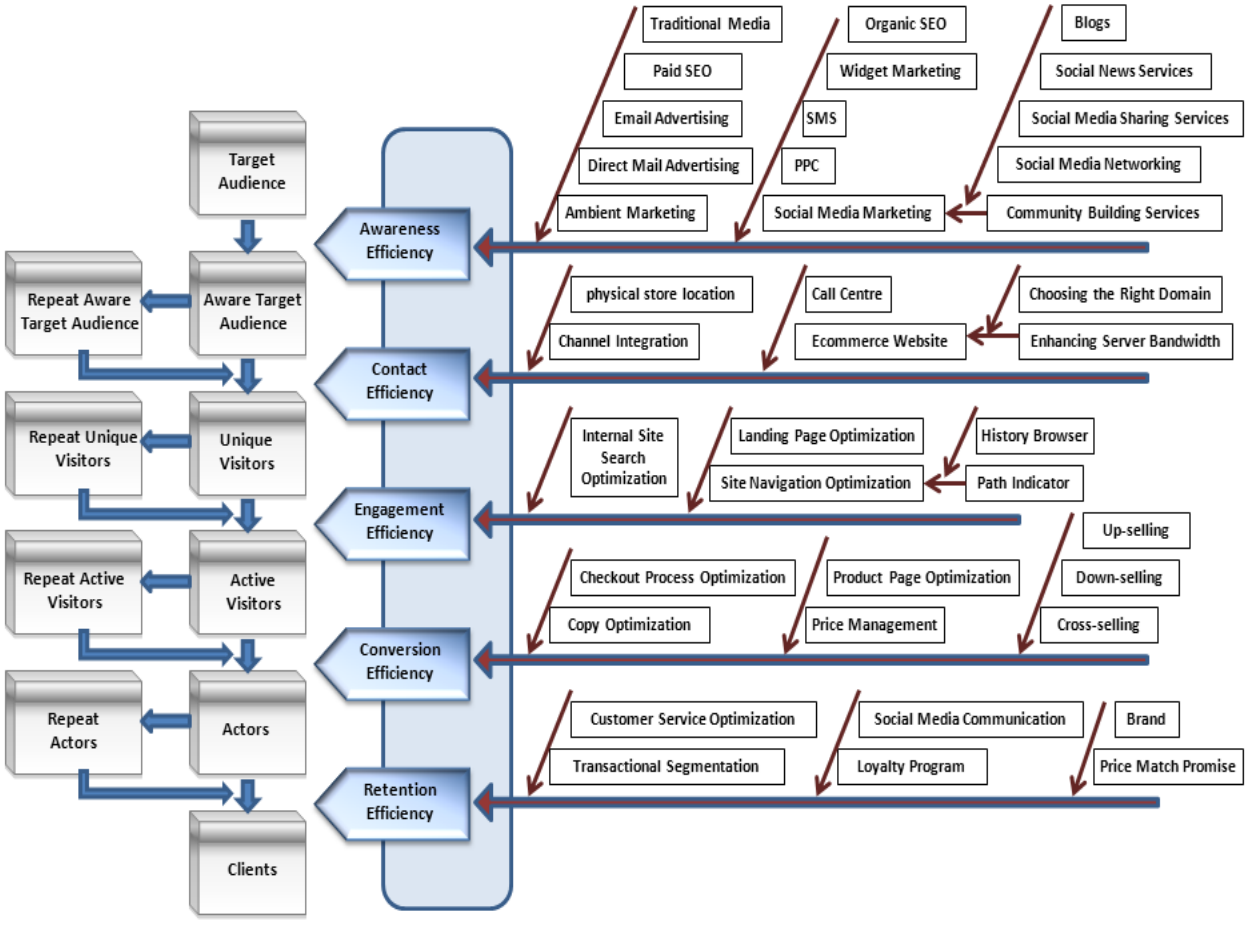

Figure 2. Adapting the new model to ebusiness discipline produces a conversion model.

We call this diagram "EBAF Conversion Model", because it illustrates how the target audience can be converted to aware the target audience, unique visitors, active visitors, actors, and finally permanent clients. Because the right hand side of the diagram also shows a summary of the main activities that should be considered in designing mining structure layers, now we are almost ready to start data warehouse development phase.

Following the roadmap provided by 5M, results in EBAF analysis core in a shape of a trilateral analysis server. It integrates enterprise multilayer KPI analysis, multilayer multidimensional analysis, and multilayer data mining analysis. Figure 3 provides an overview of characteristics of this core. EBAF multilayer enterprise KPI analysis offers a presentational business insight of critical measures. EBAF multidimensional cube analysis delivers an interactive, investigative, and exploratory business perception. EBAF multilayer data mining analysis has a proactive role to provide discovery business vision.

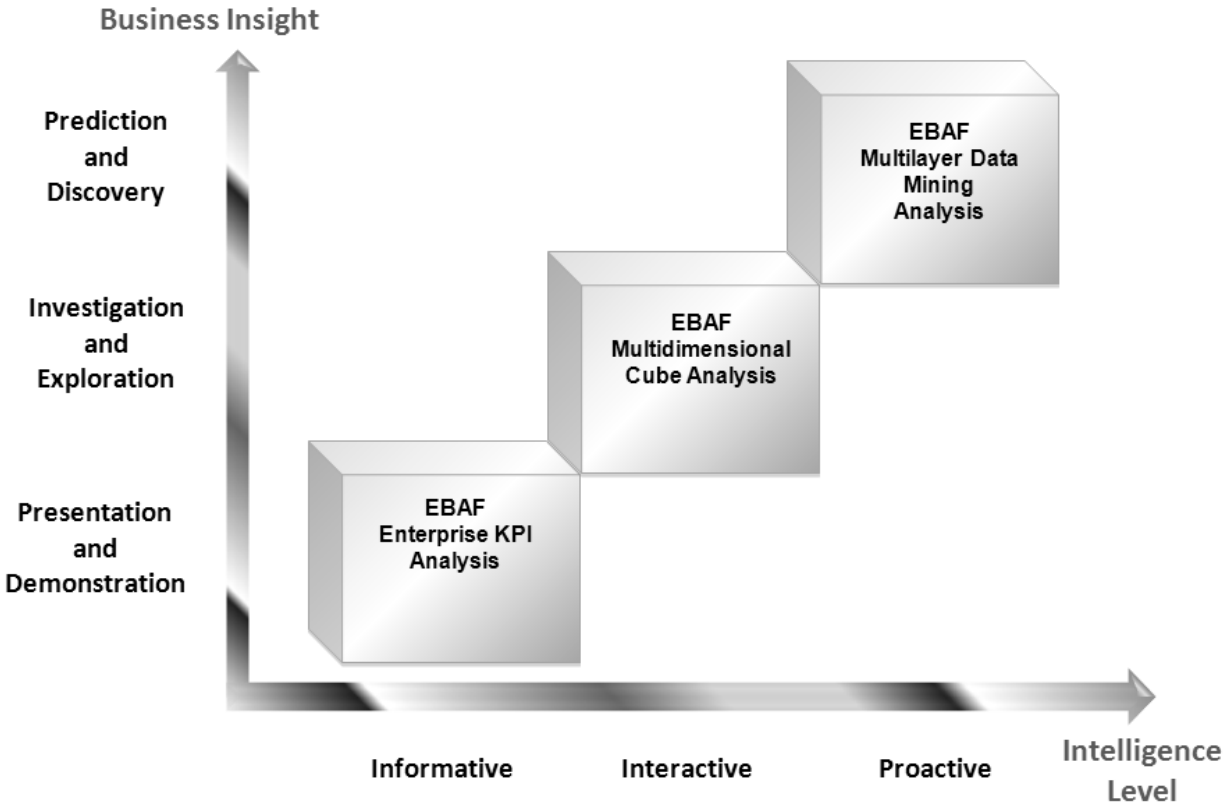

Figure 3. Analysis core characteristics at the third stage of new model.

Model Accuracy Testing and Verification

Each software project represents a complex system with its own life cycle, starting with the phases of planning and designing up to the implementation, testing, and validation. This section is about testing EBAF results and the process of assessing how the EBAF models perform against real data. Testing is an essential part of the design life-cycle of any software application. The literature on software testing and validation is huge and it includes detailed discussion of different approaches to it. But there is a big difference between testing a generic software system developed based on 5M EBAF and a normal software product. A system developed

from 5M EBAF model has several aspects. Therefore testing such a system is also multifaceted issue. One of the main features of such a system is that its multidimensional structure is constructed upon a data warehouse. Therefor it seems that data warehouse testing can be considered at least as a fundamental procedure. There are many general system testing activities that can be used in testing the underneath data warehouse of a 5M EBAF product, e.g., data backup testing, data recovery testing, on-line time response testing, and data accessibility testing. But still there are big differences between testing a system based on data warehousing and generic software systems. Golfarelli and Rizzi (2009) have spotted the differences between testing data warehouse systems and generic software systems or even transactional systems as:

- Software testing is predominantly focused on program code, while here testing is directed regarding available data and required information. As a matter of fact, the key to data warehouse testing is to know the data and what the answers to user queries are supposed to be;
- Data warehouse testing involves a huge data volume, which significantly impacts performance and productivity;
- Data warehouse testing has a broader scope than software testing because it focuses on the correctness and usefulness of the information delivered to users. In fact, data validation is one of the main goals of data warehouse testing;
- Though a generic software system may have a large number of different use scenarios, the valid combinations of those scenarios are limited. On the other hand, data warehouse systems are aimed at supporting any views of data, so the possible combinations are virtually unlimited and cannot be fully tested;
- While most testing activities are carried out before deployment in generic software systems, data warehouse testing activities still go on after system release;
- Typical software development projects are self-contained. Data warehousing projects never really come to an end. It is very difficult to anticipate future requirements for the decision-making process, so only a few requirements can be stated from the beginning. Besides, it is almost impossible to predict all the possible types of errors that will be encountered in real operational data. For this reason, regression testing is inherently involved.

Like any other software system, different types of tests can be devised for data warehouse systems. Regression test checks that the system still functions correctly after a change has occurred. Regression test is important for data warehouse systems because of their ever-evolving nature. Unit test is a white-box test performed on each individual component considered in isolation from the others. Integration test is a black-box test where the system is tested in its entirety. The peculiar characteristics of data warehouse testing and the complexity of data warehouse projects ask for a deep revision and contextualization of these test types, aimed in particular at emphasizing the relationships between testing activities on the one side, design phases and project documentation on the other side (Golfarelli & Rizzi, 2011). According to 5M approach, the issues about data warehouse verification are mainly considered in the third phase of 5M, regarding the Tanuska framework (Tanuska, Moravcik, Vazan, & Miksa, 2009).

It is also important to consider the issue for proactive aspect of the framework. Needless to say, it is important that the researcher validate these mining models generated in the framework by understanding their quality and characteristics before deploying them into a production environment. Here model accuracy testing and evaluation serve two purposes. The first purpose is the prediction of how well the final model will work in the future or even whether it should be used at all. The second purpose is to find the best model that maintains EBAF objectives. The approach to model validation in this research is partitioning data into training and testing

sets. This approach is an established method and is widely used by practitioners. In this approach, some portion of data from the training data set is reserved for testing. In Figure 4, the lift chart graphically represents the improvement that the models provide when compared against a random guess for 24.75% population percentage.

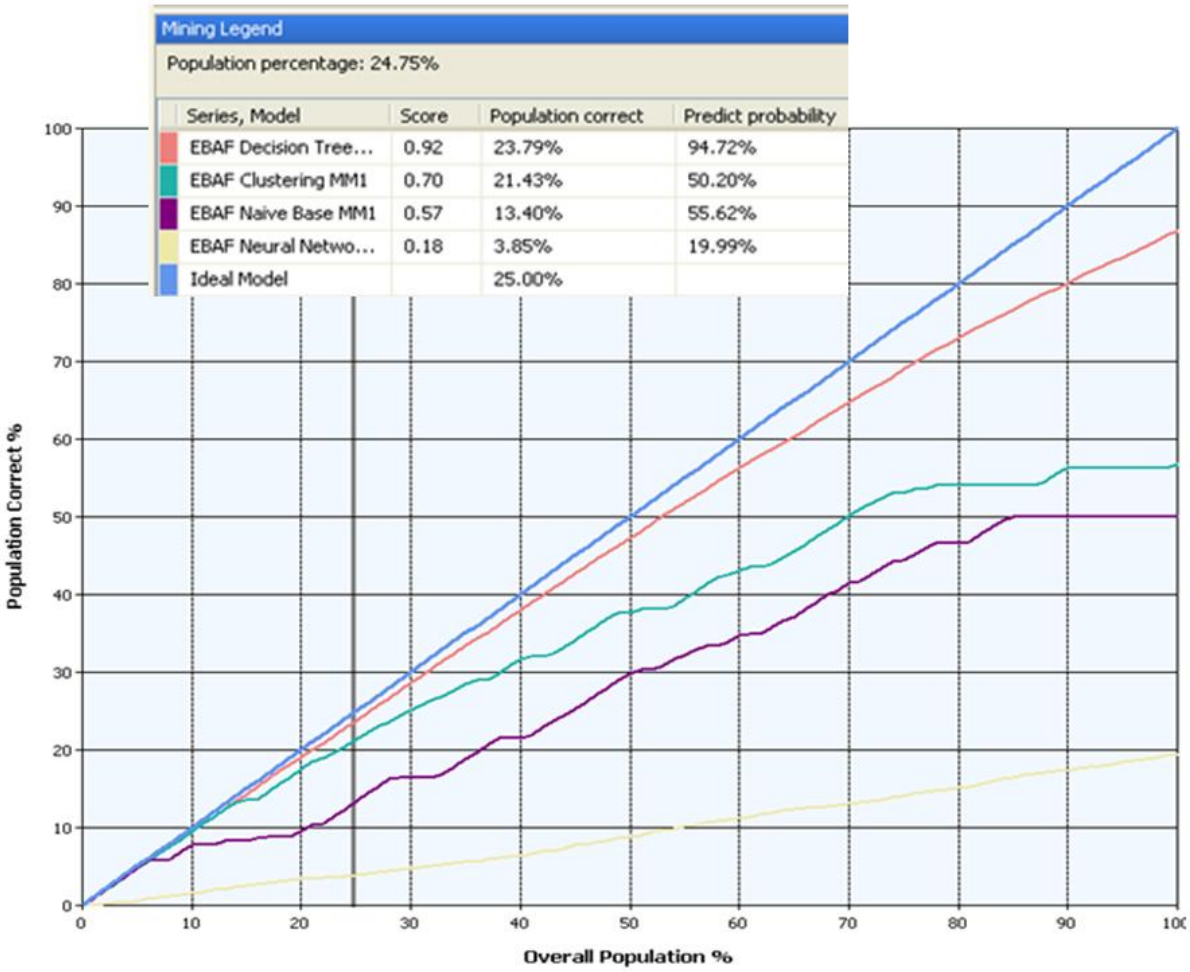

Figure 4. Lift chart shows the significant improvement against a random guess for 24.75% population percentage.

There are five lines in this graph. The bottommost line in the chart is the result of the neural network model that does not have any effect on the prediction improvement. Therefore the line can also be considered as a blind guess. The straight uppermost line is for the ideal model that each model tries to get closer to it. The three lines below the ideal model are correspondently related to “EBAF Decision Tree MM1”, “EBAF Clustering MM1”, and “EBAF Naïve Base MM1” models.

Figure 5 helps to link this chart to classification matrix and double check the results. The classification matrix reveals that the correct population for whole overall population is Total Correct Population / Total Population = (562 + 400 + 163 + 777 + 252) / (841 + 830 + 725 + 885 + 1031) = (2154 / 4312) = 49.95% for “EBAF Naïve Base MM1”. By selecting 99% of population, the lift chart shows that population correct figure is approaching to this value.

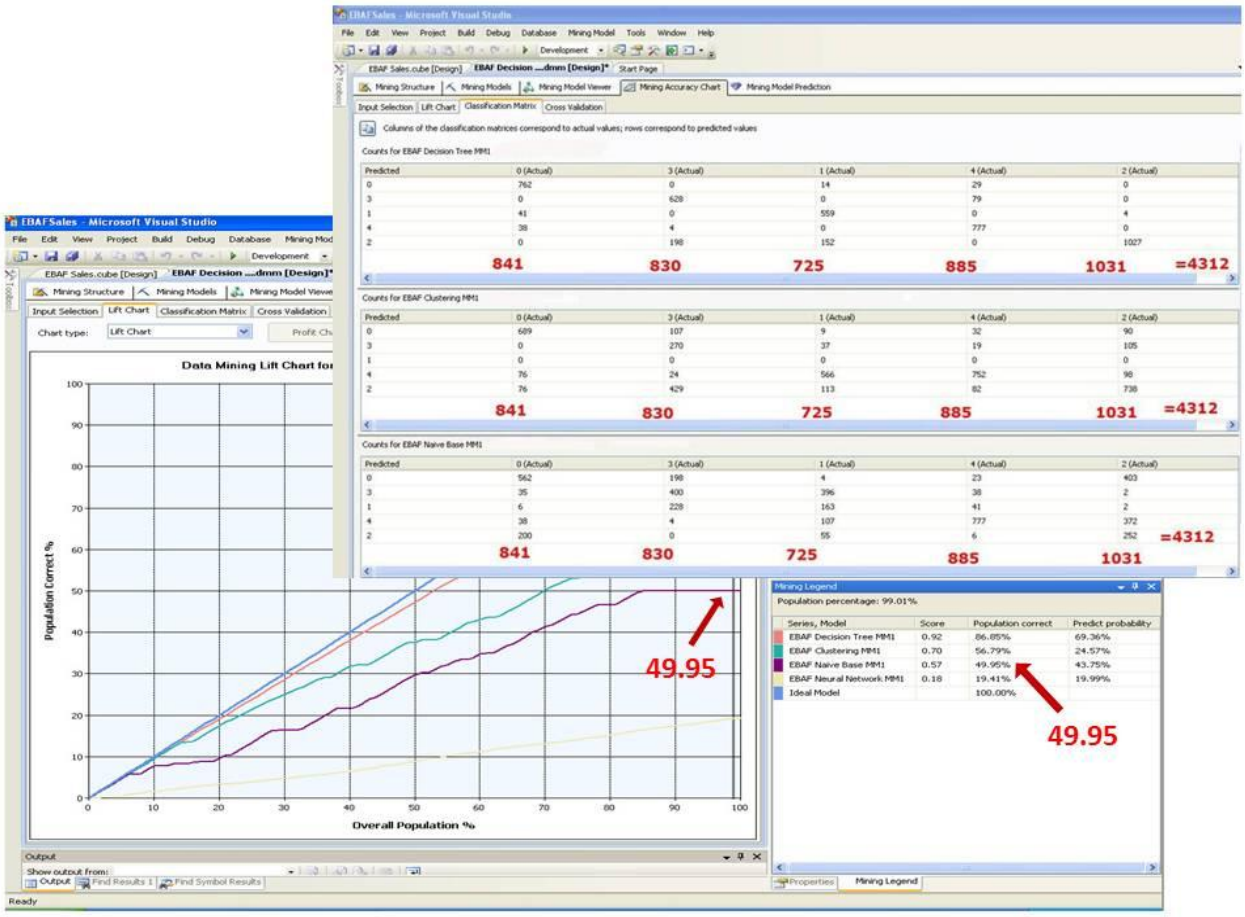

Figure 5. The figures in classification matrix verify the lift chart results

The value of the models in increasing the turnover may be better understood using the profit chart. Like a lift chart, a profit chart can be used to compare multiple models. To get a better understanding of the underlying explanations in resulted figures, the correspondent lift chart must be linked to the resulted profit chart. Figure 6 focuses on calculating the profit gained by the EBAF Decision Tree MM1 model. The figure yields £354,300 revenue by multiplication of population, population correct, and revenue per individual, i.e., 50000 × 47.24 × 15. Taking out the cost that is 80,000, will result in a £274,000 net profit.

The results are calculated based on assuming that revenue per individual is £15, individual cost is £3, and there is also a £5,000 fixed cost. The total population is assumed to be 50,000. The chart shows that applying "EBAF Neural Network MM1", does not outcome in any more profit. It reveals that applying EBAF Decision Tree MM1, EBAF Clustering MM1, and EBAF Naïve Base MM1, respectively result in £274,302, £201,771, and £143,504 more profit. The chart clearly proves that EBAF Clustering MM1 and EBAF Naïve Base MM1 cannot produce any more profit if we try to cover more than 75% of population:

Fixed Cost = 5,000

Individual Cost = 3

Revenue per Individual = 15

Population Percentage (Chosen by grey line) = 50%

Population Correct% (Extracted From Lift Chart) = 47.24%

Revenue = (50,000 × 0.4724 × 15) = 354,300
Cost = (50,000 × 0.5 × 3 + 5,000) = 80,000
Profit gained by EBAF Decision Tree MM1 model = (354,300 – 80,000) = 274,000.

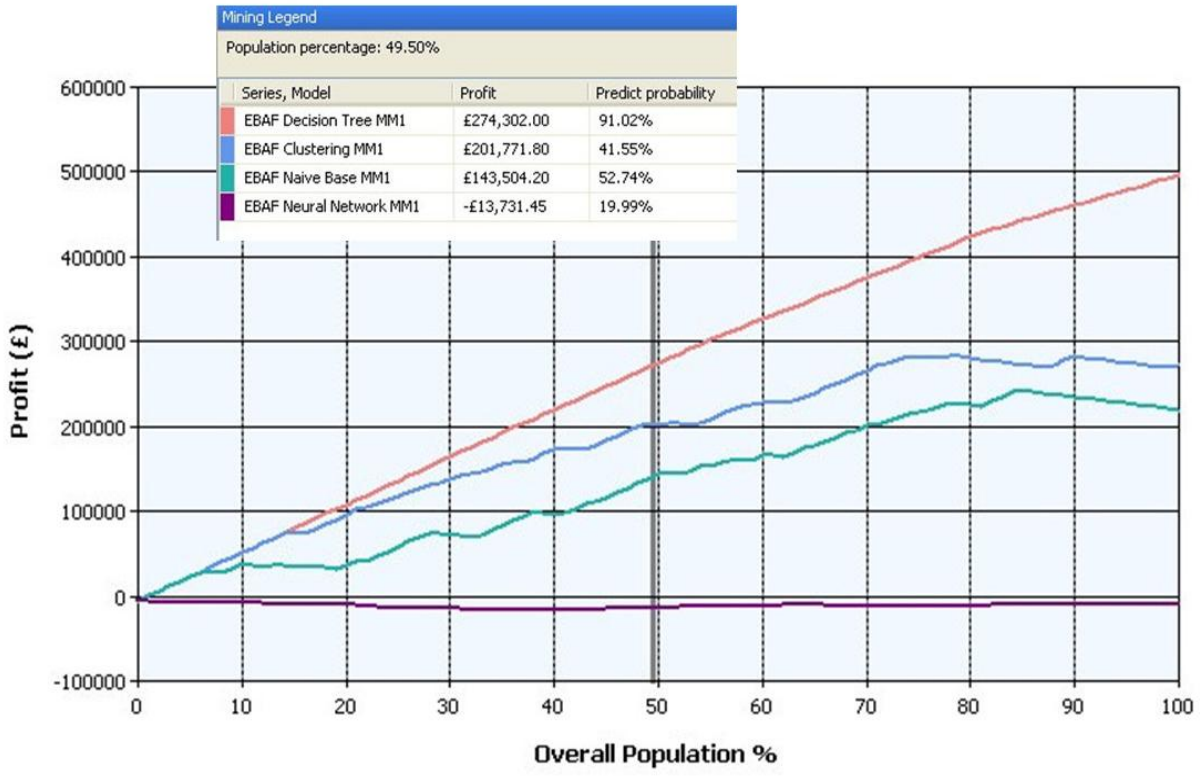

Figure 6. Calculating the profit gained by EBAF Decision Tree MM1 model covering 50% overall population.

Conclusions

Distributed databases that use fragmented data storage have practical problems in hosting existing data engineering models. A novel multidimensional approach is presented to solve the problem. The model is known as 5M. The model is evaluated and validated by adapting to ebusiness as a case study and test results show significant enhancement in decision-making process. The resulted ebusiness framework seems to be very successful in providing higher levels of business intelligence for the enterprises utilizing ecommerce as their main transactional model. There is also a debate about the expense of employing the model in enterprises. Though the model provides a solid insight for organization management, it can be costly due to providing the required data sources for multilayer influencers and developing multilayer mining structures. Therefore a simplified version of the model is also provided. This shortened version of the model can be called 4M and seems suitable for low-budget projects. The emphasis on building multilayer mining structures in 5M is not seen in 4M. EBAF is the name of a case study evaluates and validates the new model. EBAF provides a roadmap to gain incredible competitive advantages in ecommerce marketplace. EBAF offers the key ability to respond with more agility to changing business conditions using effective and corresponding actions. EBAF analysis core utilizes the EBAF Conversion Model constituents to create multilayer mining structures and finally enhances and optimizes the conversion model's efficiency factors.

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Chinese Business Review, ISSN 1537-1506
December 2013, Vol. 12, No. 12, 846-852

Determining the Environmental and Economic Benefits of Life Cycle Assessment on Example of the Power Plants in Poland

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The paper presents a method of life cycle assessment (LCA) to determine the impact of the electricity produced on the environment. To determine the environmental burdens and benefits the LCA technique is used, methodologically based on ISO 14040 series. In addition, the usefulness of this method to assess the energy sector has been shown. To evaluate the process, SimaPro software and the method of Eco Indicator 99 were used, which allows to get the results of the burden and benefit with taking into account three categories of damages: ecosystem quality, human health, and raw materials. This paper presents the impact of electricity generation on the environment in coal power plants. The article also points to the directions of the Polish energy sector and pointed to the need to determine the environmental risks associated with the production of energy. A detailed analysis by the method of LCA is made to compare the environmental impact of electricity generation in the Łagisza Power Plant and Turów Power Plant. It is pointed to the difference in the results obtained. Moreover, the causes of the reported environmental impacts are discussed. Measures are identified which will help to reduce in the future the impact of the electricity produced on the environment during the production of electricity.

Keywords: energy sector, ecology, economy, environmental impact, coal

Introduction

From the point of view of generating energy management practices is necessary to estimate the amount of required energetic resources, materials, the amount of emitted dust, solid wastes (ashes), which is generated in the course of production as well as electricity, which is also necessary during energy production. It is also crucial to consider the distance and means of transport of energetic resources from the place of extraction to the power station (Dzikuć, 2013b). In recent years, there has been a substantial increase of requirements concerning the very manner of energy production and its impact on the environment. There appeared a need for finding such a tool, which would take into consideration many aspects of the issue. The main objective of this paper is to present the life cycle assessment (LCA) method, which is an effective tool helping provide a complex

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evaluation of particular manners of energy production (Dzikuć & Piwowar, 2013).

The last couple of years have brought some important changes in the electric power industry that can be observed in most EU countries. Energy strategy of the EU has become one of the most important factors influencing the development of the member states. Poland is a country with electric energy produced predominantly in hard and brown coal-fired power stations (Urban & Dzikuć, 2013).

All coal-fired power stations affect the environment in a negative way. As a result of the rising levels of environmental pollution, ways of limiting the negative human impact on the environment are being sought. Novel solutions, aimed at reducing the negative impact on the environment, are being introduced as a reaction to the rising awareness of the society and increasingly more stringent requirements imposed by laws. One of the ways allowing an evaluation and comparison of the environmental impact of different means of energy generation is the LCA method. The LCA can be applied to products, processes (encompassing full life cycle) as well as to entire branches of industry (Dzikuć, 2013a). In connection with the growing importance of energy efficiency in industry, the paper provides examples of the LCA applications to two electric power plants: the Łagisza Power Plant and Turów Power Plant.

The Polish economy is heavily dependent on coal, and is particularly sensitive to the EU's determination to protect the environment. The EU is a political region with serious approach about the commitments related to the elimination of environmental hazards, particularly for: climate change, biodiversity, and air quality (Björklund, 2012). The use of LCA in this sector is a good solution, since this technique allows to identify specific environmental influences (among others: climate change, biodiversity, and air quality), to determine their size, which allows for the accurate assessment, comparison, process optimization, or elimination (Zarębska & Dzikuć, 2013).

Research Method

Ecological LCA is a research method aimed at an analysis of environmental problems. Such an analysis is based on identifying and determining the amount of used up materials and energy, as well as on determining the pollution levels, and on a subsequent evaluation of the impact these elements might have on the environment (Dylewski & Adamczyk, 2012). This method can be used to identify potential problems and help to determine ways of improving environmental quality.

One of the main goals of the LCA method is to analyse the potential impact of production processes on the environment and to determine ways to improve the quality (Łasiński, 2012) of the environment. The possibility of the "cradle-to-grave" product analysis is an important feature of the LCA method. It is also possible to determine the environmental impact of a product not only during the production or resources acquisition phases but also during the product usage and utilisation phases (Dylewski & Adamczyk, 2011). The LCA method allows an effective management of limited resources, since it is based on real input and output data of a given process (Zhang & Colosi, 2013).

LCA is an established method for assessing the potential environmental impact associated with a product or service system (Wach, 2002). A LCA consists of four main phases:

(1) Goal and scope definition describes the objective of the study (goal), and the methodological approach used (scope);

(2) Inventory analysis examines the processes in the product system and quantifies for each process all the input and output data (i.e., inventory data). Economic inventory data include the amount of resources, materials,

and energy needed to manufacture a product. Environmental inventory data include all extracted natural resources which are used in the process (inputs), and emissions and waste released to the environment (outputs);

(3) Impact assessment converts the inventory data into their contribution to environmental impact in one or more impact categories, e.g., global warming potential, resource depletion, eutrophication, toxicity;

(4) Interpretation evaluates the results and their robustness from the previous phases and draws conclusions and/or recommendations. This phase also examines the confidence and reliability of the LCA results through sensitivity, scenario, and/or uncertainty analyses (Harst & Potting, 2103).

The International Standard Organization (ISO) defines the LCA as a method allowing an analysis of environmental aspects and of a potential production impact. To the implementation of the LCA a computer program SimaPro and the procedure Eco Indicator 99 were used.

This procedure allows the unequivocal assignment of the 11 categories to three categories of impact damage, such as human health (Human Health), the quality of the ecosystem (Ecosystem Quality), and natural resources (Resources). Additionally, it enables to present the final results of LCA in the dimensionless unit referred to as the so-called eco-point (Pt) (Eco-indicator 99). Value 1 Pt reflects the ratio of the total annual burden on the environment in Europe (emissions, the volume of consumption of raw materials) to the number of its inhabitants, and multiplying by 1,000 (scale factor). In this way the Eco Indicator 99 of 1,000 Pt corresponds to an annual total environmental load per capita in Europe (Zarębska & Dzikuć, 2013).

The analysis following the above steps renders is possible to picture the impact and divide it into 11 main categories: carcinogenic compounds, organic compounds, inorganic compounds, climate change, radiation, ozone hole, ecotoxicity, acidification/euthropication, land use, fossil fuels and three damage categories: human health, ecosystem quality, resources consumption including the type (Dzikuć, 2013b), normalisation and a final score (weighting) that measures the environmental impact of a product in Pt (eco indicator point) units, where 1 ecopoint (Pt) expresses a value representing one thousandth of a yearly environmental impact of one inhabitant of Europe (Dąbrowski & Dzikuć, 2012). The use of methods such as the LCA can save the amount of energy resources consumed. Lower resource consumption helps to ensure energy security. LCA method is especially useful for analysis to determine the impact on the environment during the production of energy. In Poland, more than 90% of electricity is produced by burning coal and lignite. Consumption of non-renewable energy resources has a negative impact on the environment. When it comes to the energy of emission of toxic gases into the atmosphere. Through an analysis of LCA is possible to evaluate and compare the various energy technologies and exhaust after-treatment. LCA method takes into account the amount of energy consumed, which also is of great importance when comparing the impacts on the environment, which takes place during the production of electricity (Dzikuć, 2013c).

Interpretation is a phase of LCA, whose task is to analyze conclusions, check completeness, analyze sensitivity, other analyses, recommendations and report. Moreover, this phase allows to define elements of great risk, analysis of sensitivity of above mentioned elements, to define the manner of minimization of threats as well as assess priorities of possible corrections and their feasibility (Radhi & Sharples, 2013). The impact assessment allows for defining trustworthiness of results at a high level and formulated conclusions and elaborated recommendations become a complete and objective report from the research. The assessment conducted according to the mentioned procedure allows to present the results of impact in relation to nine impact categories included in Table 1. The presentation of the result of environmental interference of electricity,

as well as other products subject to the assessment, takes place in the form of Pt units (point of eco indicator), where 1 point of eco indicator (Pt) is a value, which represents one thousandth of annual environment load of one citizen in Europe (Piwowar & Dzikuć, 2013).

Table 1

Categories of Environmental Impact

No.	Category	Description
1	Abiotic impoverishment	Extraction of non-renewable ores of mineral resources
2	Energy impoverishment	Extraction of non-renewable energy carriers. This category can be included in category 1
3	Greenhouse effect	Atmospheric absorption of radiation leading to the increase of global temperature
4	Ozone hole	Increase of ultraviolet radiation reaching the surface of Earth caused by impoverishment of ozone layer
5	Water and soil contamination	Exposing biota to toxic substances
6	Acidification	Increase of water and soil acidity
7	Contamination of humans	Exposing human health to toxic substances appearing in water, air, and soil, mainly with food
8	Creating photochemical oxidants	Emergence of atmospheric particles causing photochemical smog
9	Eutrophication	Reduction of oxygen amount in water or soil by emission of substances causing increase of biomass production

Note. Source: Clift, 1997.

Results and Analyses

The Łagisza Power Plant is located in Będzin in Zagłębie Dabrowskie. Primary activity of the Łagisza Power Plant is the production transmission and sale of electricity. The Power Plant Łagisza is a professional power plant with 840 MW of electric power. The Łagisza Power Plant is located in the neighborhood of coal mines in the industrialized region. Near the the Łagisza Power Plant there is also a large number of potential consumers of electricity. The Power Plant Łagisza operates on the coal.

The Turów Power Plant is a thermal power plant, a condensation block of intercooled reheat of steam and closed cooling water system. The share of power installed in the Turów Power Plant in the Polish energy system is about 7%. The main fuel in the Turów Power Plant is brown coal.

The Łagisza Power Plant produced in 2012, 3,958,191 MWh, while the Turów Power Plant produced in 2012, 11,898,898 MWh. In 2012, the Łagisza Power Plant issued 3,546,545 Mg of CO_2. However, the Turów Power Plant issued 10,802,510 Mg of CO_2 in the same year.

The objective is to determine and compare the environmental impact of thermal energy based on coal using the LCA, a computer program SimaPro. 1 MWh is used as a functional reference unit of the system which describes the impact of the product on the environment (e.g.:1 ton of coal).

The data that were used to study come from 2012 and include the elements included in the system used in the production of electricity, such as coal, water, electricity and outgoing parts of the production system, the amount of produced electricity and heat, and any resulting contamination during production.

The results of the LCA applied to the three damage categories (see Table 2 and Figure 1) show that the category “resources” has the highest environmental impact, with energy production from coal. However, studies show that larger impact on the environment was characterized by the production of electricity in the Łagisza Power Plant (hard coal-fired). This can be explained by the fact that the hard coal reserves are scarce.

Table 2

The LCA Results—The Three Damage Categories

Impact categories	Unit	Łagisza Power Plant	Turów Power Plant
Human health	Pt	7.28	7.23
Ecosystem quality	Pt	0.90	0.30
Resources	Pt	19.57	17.74
Total	Pt	27.75	25.27

Note. Source: Compiled on the basis of the result obtained with SimaPro.

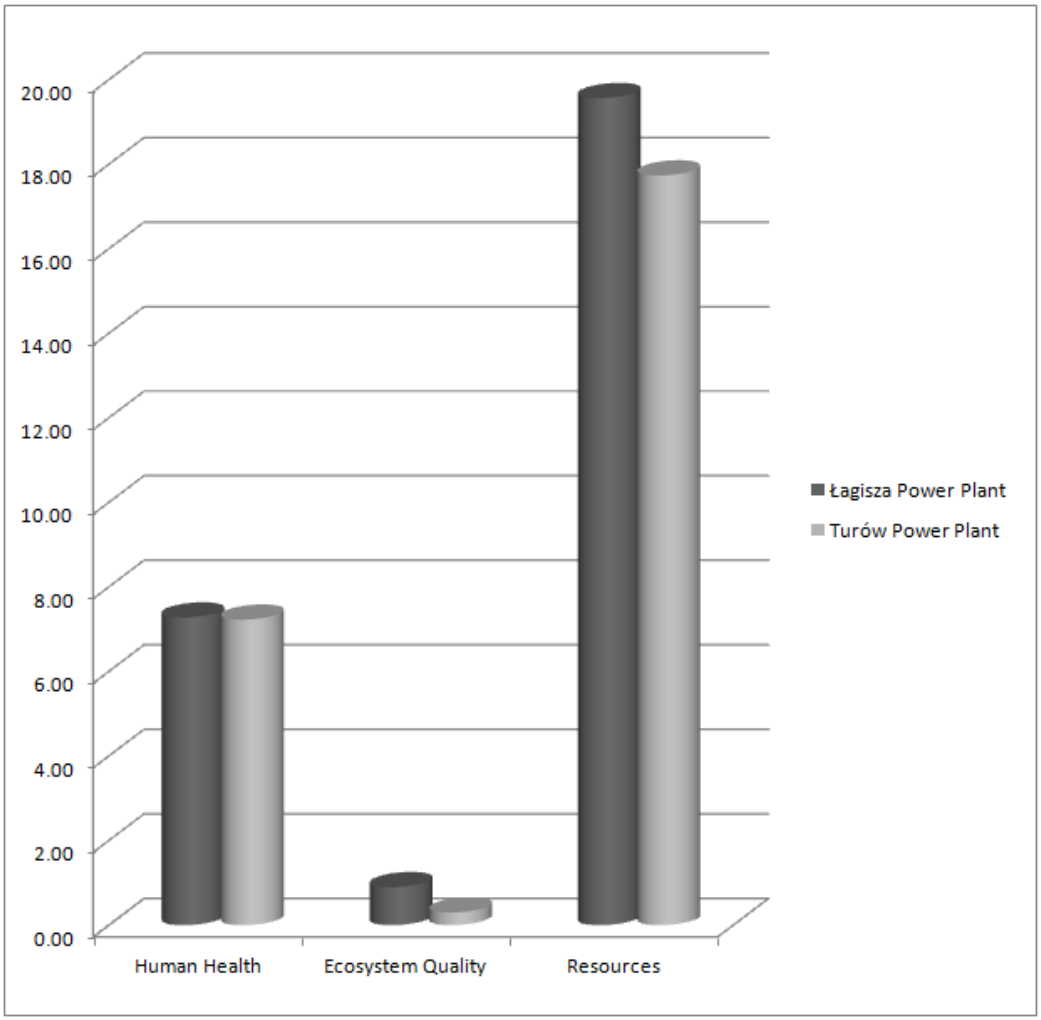

Figure 1. The LCA results—the three damage categories. Source: Compiled on the basis of the result obtained with SimaPro.

The next important factor affecting the environment in relation to the three damage categories is the "human health" category. The largest impact on "human health" has harmful emission into the atmosphere (see Table 3). Here the impact of energy production from hard coal and brown coal is several times smaller. Contrast these results in the category of "human health". The difference in this category is much smaller than in the case of the category "resources". The least impact of the final result the research was aimed at category "ecosystem quality". However, in this category were the biggest differences in the results. The Łagisza Power Plant was three times greater impact on the environment than the Turów Power Plant in this categories impact.

Table 3

Emissions of Gaseous and Particulate (2012)

Harmful emissions	Łagisza Power Plant	Turów Power Plant
Particulates	1,345 Mh	243 Mg
SO_2	33,627 Mg	3,818 Mg
NO_2	11,790 Mg	5,678 Mg
CO_2	11,109,188 Mg	3,546,545 Mg

Note. Source: Retrieved from http://www.elturow.pgegiek.pl/ & http://www.pke.pl/elektrownie.

All three categories of impact indicate a higher impact on the environment in the event of the Łagisza Power Plant. This is a clear impact. A less negative impact in the case of the Turów Power Plant results from the application of brown coal in it. Production of electricity using the brown coal allows significant savings of energy resources. It also renders it possible to achieve lower indicators of emissions per unit of energy produced.

Factor hindering the development of electricity generation by means other than through the burning of coal is the high cost of generating electricity using other raw materials or energy production based on renewable energy sources.

Conclusions

Electricity generation using more ecological methods currently has economic significance. Poland is a country that pays fees for CO_2 emissions. In Poland, over 90% of electricity is produced by using coal. Use own energy resources is economically justified. However, it is necessary to find solutions that will limit harmful emissions into the atmosphere.

It should be noted that there is a significant difference between the environmental impacts of energy production in the Łagisza Power Plant and the Turów Power Plant. Poland as a country having large coal reserves will use this source of energy for decades. It is therefore important to develop energy technologies based on coal. As studies show it is possible to minimize the negative environmental impacts of energy production.

Generations of electricity in coal-fired power plants have a negative impact on the environment. Looking for solutions that will help reduce the environmental impact related to energy production is of great significance for people and ecosystem quality. The difference in the analyzed results shows that it is possible to effectively reduce the negative impact on the environment. The Turów Power Plant by generating electricity is able to provide less environmental impact per unit of electricity generated. Calculated environmental burdens indicate that technologies using brown coal in this case have a smaller impact on the environment.

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Chinese Business Review
Volume 12, Number 12, December 2013
David Publishing Company
240 Nagle Avenue #15C, New York, NY 10034, USA
Tel: 1-323-984-7526, 323-410-1082; Fax: 1-323-984-7374, 323-908-0457
http://www.davidpublishing.com, www.davidpublishing.org
economists@davidpublishing.com, china4review@hotmail.com
ISSN 1537-1506